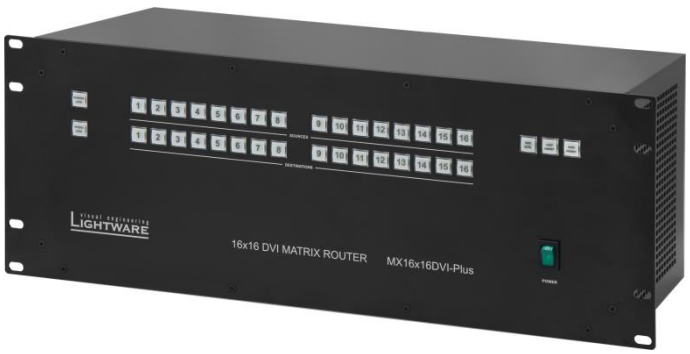
visual engineering
LIGHTWARE

MX16x16DVI-Plus
MX12x12DVI-Plus
MX9x9DVI-Plus



User's Manual

SAFETY INSTRUCTIONS

Class I apparatus construction. This equipment must be used with a main power system with a protective earth connection. The third (earth) pin is a safety feature, do not bypass or disable it.

This equipment should be operated only from the power source indicated on the product.

To disconnect the equipment safely from power, remove the power cord from the rear of the equipment, or from the power source. The MAINS plug is used as the disconnect device, the disconnect device shall remain readily operable.

There are no user-serviceable parts inside of the unit. Removal of the top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

The apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.

The apparatus must be safely connected to multimedia systems. Follow instructions described in this manual.

Replacing the AC fuse

Unplug the AC power cord from the equipment

Locate the AC fuse on the rear of the unit

Replace only the AC fuse as indicated on the rear panel of the unit: 3.15A fast blowing

Connect the power cord to the switcher and to the AC power source. Make sure the switcher is working properly.

WEEE (Waste Electrical & Electronic Equipment)

Correct Disposal of This Product

This marking shown on the product or its literature, indicates that it should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.

Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.

DECLARATION OF CONFORMITY

We,

Lightware Kft. 15 Peterdy Street, Budapest H-1071, HUNGARY

as manufacturer declare, that the products

MX16x16DVI-Plus
MX12x12DVI-Plus
MX9x9DVI-Plus
(Computer Matrix Switcher)

in accordance with the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EEC is in conformity with the following standards:

EMI/EMC ..... EN 55103-1 E3, EN 55103-2

Safety.....EN 60065 Class I

Date: 28 September 2012

Name: Gergely Vida (Managing Director)

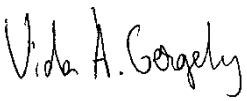
Signed: 

TABLE OF CONTENTS

1. INTRODUCTION 8

1.1. BOX CONTENTS 8
1.2. TYPICAL APPLICATION 8
1.3. FEATURES 9

2. CONTROLS AND CONNECTIONS 10

2.1. FRONT PANEL VIEW 10
2.2. REAR VIEW 11
2.3. ELECTRICAL CONNECTIONS 12
2.3.1. DVI inputs 12
2.3.2. DVI outputs 12
2.3.3. Equipotential connector 12
2.3.4. RS-232 / RS-422 control port 13
2.3.5. Ethernet port 13

3. TECHNOLOGIES 14

3.1. UNDERSTANDING EDID 14
3.1.1. Basics 14
3.1.2. Common problems related to EDID 14
3.2. ADVANCED EDID MANAGEMENT 15

4. OPERATION 16

4.1. POWER 16
4.2. FRONT PANEL OPERATIONS 16
4.2.1. CONTROL LOCK 16
4.2.2. TAKE / AUTOTAKE modes 16
4.2.3. SOURCE and DESTINATION buttons 16
4.2.4. Viewing crosspoint state 16
4.2.5. Switching 17
4.2.6. Switching operations flowchart 18
4.2.7. Preset operations 19
4.2.8. OUTPUT LOCK 20
4.3. REMOTE OPERATION 21
4.3.1. Control interfaces 21
4.3.2. User interface comparison 21
4.3.3. Multiple simultaneous connections 22
4.3.4. Serial port settings 22
4.3.5. IP settings 22
4.3.6. Control protocols 23

5. SOFTWARE CONTROL – USING LIGHTWARE DEVICE CONTROLLER (LDC) 24

5.1. STEPS OF THE INSTALLATION IN CASE OF WINDOWS OS 24
5.2. STEPS OF THE INSTALLATION IN CASE OF MAC OS X 26
5.3. LDC UPGRADE 27
5.4. ESTABLISHING THE CONNECTION 28
5.5. CROSSPOINT MENU, GRID VIEW 29
5.5.1. Crosspoint operations 30
5.6. CROSSPOINT MENU, TILE VIEW 31
5.6.1. Port tiles 32
5.6.1. View mode 32
5.6.2. Crosspoint operations 32
5.7. PRESETS 34
5.8. EDID MENU 35
5.8.1. Sources and Destinations 35
5.8.2. Changing emulated EDID 36
5.8.3. Exporting an EDID 36
5.8.4. Importing an EDID 36

5.8.5. EDID Summary window 36
5.8.6. Editing an EDID 37
5.8.7. Creating an EDID 37
5.9. SETTINGS MENU 38
5.9.1. Configuration tab 38
5.9.2. Device information tab 39
5.9.3. Log tab 40
5.10. TERMINAL 41
5.11. DEVICE DISCOVERY (INFORMATION RIBBON) 41

6. WEB CONTROL – USING BUILT-IN WEBSITE 42

6.1. CONTROL MENU 43
6.1.1. Crosspoint switching 43
6.1.2. Mute outputs 43
6.1.3. Lock outputs 43
6.1.4. Preset operations 43
6.2. EDID MENU 44
6.2.1. Change emulated EDID at one or all inputs 44
6.3. STATUS MENU 46
6.3.1. Generate report file 46
6.3.2. Generate custom report 47
6.4. CONFIGURATION MENU 48
6.4.1. Automatic IP Address Configuration 48
6.4.2. Static IP address configuration 49
6.4.3. Loading the default IP settings 49
6.4.4. TCP Port Configuration 49
6.4.5. Loading the default TCP Port settings 49
6.5. TERMINAL 50
6.6. SUPPORT 50

7. ABOUT EDID MEMORY 51

8. PROGRAMMERS REFERENCE 52

8.1. CHANGING PROTOCOLS 52
8.2. PROTOCOL DESCRIPTION 52
8.3. BATCH COMMANDS 52
8.4. SWITCHING AND CONTROL COMMANDS 53
8.4.1. Switch one input to one output 53
8.4.2. Switch one input to all outputs 53
8.4.3. View connection on the specified output 53
8.4.4. View connection on all outputs 54
8.4.5. View mutes on all outputs 55
8.4.6. Mute specified output 55
8.4.7. Unmute specified output 55
8.4.8. Lock specified output 55
8.4.9. Unlock specified output 56
8.4.10. Save preset to the specified memory location 56
8.4.11. Load preset from the specified location 56
8.4.12. Preview preset 56
8.4.13. Rename a preset 57
8.4.14. Rename an input 57
8.4.15. Rename an output 57
8.4.16. Read a preset's name 57
8.4.17. Read an input's name 58
8.4.18. Read an output's name 58
8.4.19. Reload default preset names 58
8.4.20. Reload default input names 58
8.4.21. Reload default output names 59
8.4.22. Reload factory default output setup 59
8.4.23. Query IP settings 59
8.4.24. Reload factory default IP settings 60

8.4.25. Load DHCP IP settings (only IP address!) 60
8.4.26. View LAN versions 60
8.5. PORT STATUS COMMANDS 61
8.5.1. Input port status 61
8.5.2. Output port status 61
8.6. ROUTER STATUS COMMANDS 62
8.6.1. View product type 62
8.6.2. View serial number 62
8.6.3. View Firmware version of the CPU 62
8.6.4. View CPU firmware compile time 62
8.6.5. View Installed I/O cards' hardware 63
8.6.6. View installed controllers' firmware 63
8.6.7. View current control protocol 63
8.6.8. Set current control protocol 64
8.6.9. View error list 64
8.6.10. View all error lists 64
8.6.11. Clear error list 65
8.7. EDID ROUTER COMMANDS 65
8.7.1. Route EDID to the selected input (static) 65
8.7.2. Route EDID to the selected input (dynamic) 65
8.7.3. Route one EDID to all inputs 66
8.7.4. View EDID switch status on all inputs 66
8.7.5. Save EDID from output to memory location (Learn EDID) 66
8.7.6. View EDID validity table 67
8.7.7. View EDID header 67
8.7.8. Download EDID content from the router 68
8.7.9. Upload EDID content to the router 68
8.7.10. Delete all EDID from memory 69
8.8. ROUTER INITIATED COMMANDS 69
8.8.1. Restart CPU controller 69
8.8.2. Restart EDID controller 69
8.8.3. EDID status changed 70
8.8.4. Error responses 70

9. COMMANDS – QUICK SUMMARY 71

10. FIRMWARE UPGRADE 73

10.1. INSTALLING THE BOOTLOADER 73
10.1.1. Installing and launching the Bootloader software 73
10.2. UPGRADE PROCESS 74
10.2.1. Tips for the upgrade process 74
10.3.1. Firmware upgrade 75

11. TROUBLESHOOTING 82

11.1. GENERAL PROBLEMS 82
11.2. SERIAL CONNECTION PROBLEMS 82
11.3. TCP/IP CONNECTION PROBLEMS 82
11.4. PICTURE IS NOT DISPLAYED OR DISTORTED 83
11.5. BOOTLOAD 83

12. SPECIFICATIONS 85

12.1. MECHANICAL DRAWINGS 87
12.2. AIRFLOW DIRECTIONS 88

13. VERSION APPLICABILITY 89

14. WARRANTY 89

15. DOCUMENT REVISION HISTORY 89

1. Introduction

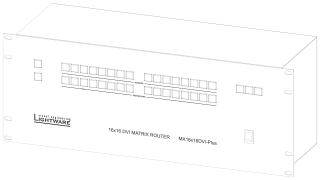
Thank you for choosing Lightware routers. The standalone DVI-Plus matrices are single link DVI matrix switchers with various DVI inputs and DVI outputs respectively, which routes any input(s) to any combination of output(s).

The routers conform to DVI and HDMI specification without HDCP encryption, and switch signals between 25 - 225 MHz pixel clock frequency: from 640x480@60Hz to 1920x1200@60Hz or 2048x1080@60Hz resolutions.

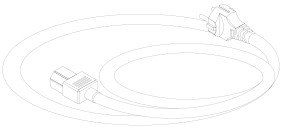
The input signals are compensated for 12dB loss and outputs are pre-emphasized by +6dB, this way cable lengths up to 20 meters (65 feet) can be used.

The switcher has an RS-232 (or RS-422 optional) and an RJ45 LAN port for remote control applications and a control panel for local control operation. Front panel buttons are illuminated and reconfigurable with text for informative system integration.

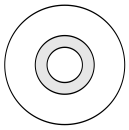
1.1. Box contents



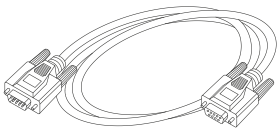
Matrix router



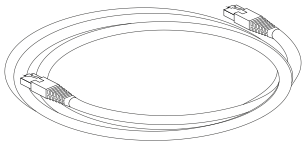
IEC power cable



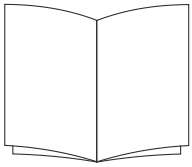
CD-ROM with Lightware Device Controller SW



RS-232 9-pole D-sub straight serial cable



UTP cross-link cable



User's manual (this document)

1.2. Typical application

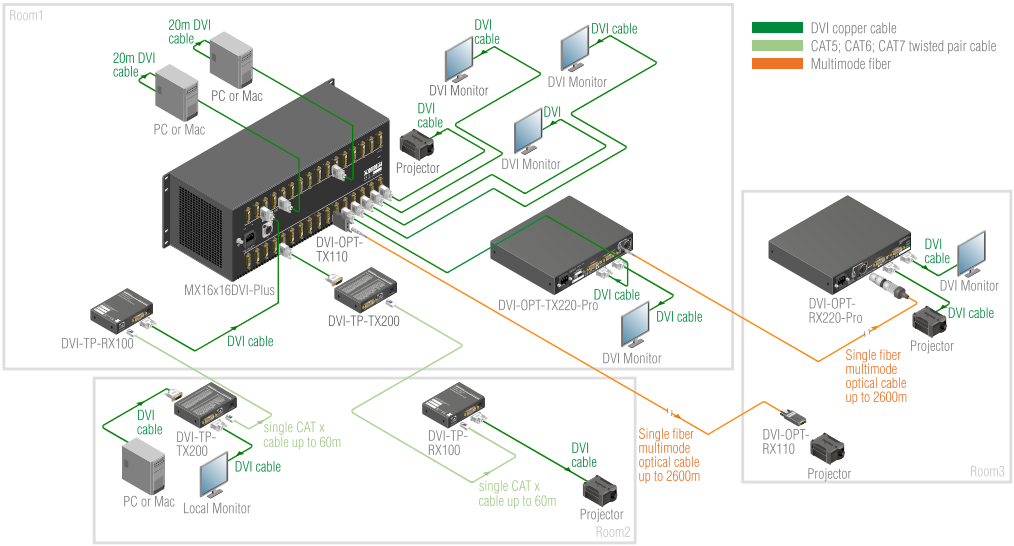


Figure 1-1. Typical application for MX16x16DVI-Plus

1.3. Features

- **Advanced EDID Management –** The user can emulate any EDID on the switcher's inputs independently, read out and store any attached monitor's EDID in 100 internal memory locations, upload and download EDID files using Lightware Device Control Software.
- **Non-blocking cross point matrix architecture –** The router allows any input to be switched to any output or more outputs simultaneously.
- **2.25 Gb/s channel transmission –** Routes any DVI single link and HDMI signal between 25 and 225 MHz pixel clock frequency conforming to DVI and HDMI standards.
- **Supports all HDTV resolutions –** 720p, 1080i, 1080p 2K etc. HDTV signals without HDCP encryption up to 225 MHz pixel clock frequency regardless of the actual resolution passed through the router.
- **Supports HDMI signals –** non HDCP encrypted HDMI signals (with embedded audio) are handled properly.
- **Cable equalization –** DVI cables up to 20 meters can be used on all inputs thanks to the +12dB compensation.
- **Output boost –** DVI cables up to 15 meters can be used on all outputs thanks to the +6dB pre-emphasizing circuit.
- **Control by front panel buttons –** 16 or 12 or 9 source select, 16 or 12 or 9 destination select, Take/Auto, Load Preset, Save Preset, Control Lock and Output Lock.
- **Buttons with custom labels –** Each button has a removable flat cap and a translucent label that can be inserted under the cap to identify sources and destinations.
- **RS-232 or RS-422 control –** Simple ASCII based-protocol is used for switching, preset calling, status request, etc.
- **Ethernet control –** TCP/IP Ethernet 10Base-T or 100Base-TX (Auto-Sensing).
- **Built-in WEB site –** Easy access from a WEB browser to control and configure the switcher.
- **Universal power supply –** The built-in power supply accepts AC voltages from 100 to 240 Volts with 50 or 60 Hz line frequency on standard IEC-320 C14 connector.
- **Power failure memory –** In case of power failure, the unit stores its latest configuration, and after next power up it loads automatically.
- **Fiber cable support –** Self-powered DVI fiber cables use +5V from DVI sources (graphic cards, etc.). Those cables usually consume more than the maximum allowed value (50 mA) according to DVI 1.0 standard. DVI-Plus series supports +5V 500 mA constant current output on each DVI output to power long distance fiber optical cables.
- **Zero frame delay –** Lightware's matrices add no frame noticeable delay to the switched signal. There is no frame or line period delays to the signals when passing a Lightware router.

Application examples

- Small classrooms,
- Multi-room video control,
- Avionics,
- Military,
- Conference rooms.

2. Controls and connections

2.1. Front panel view

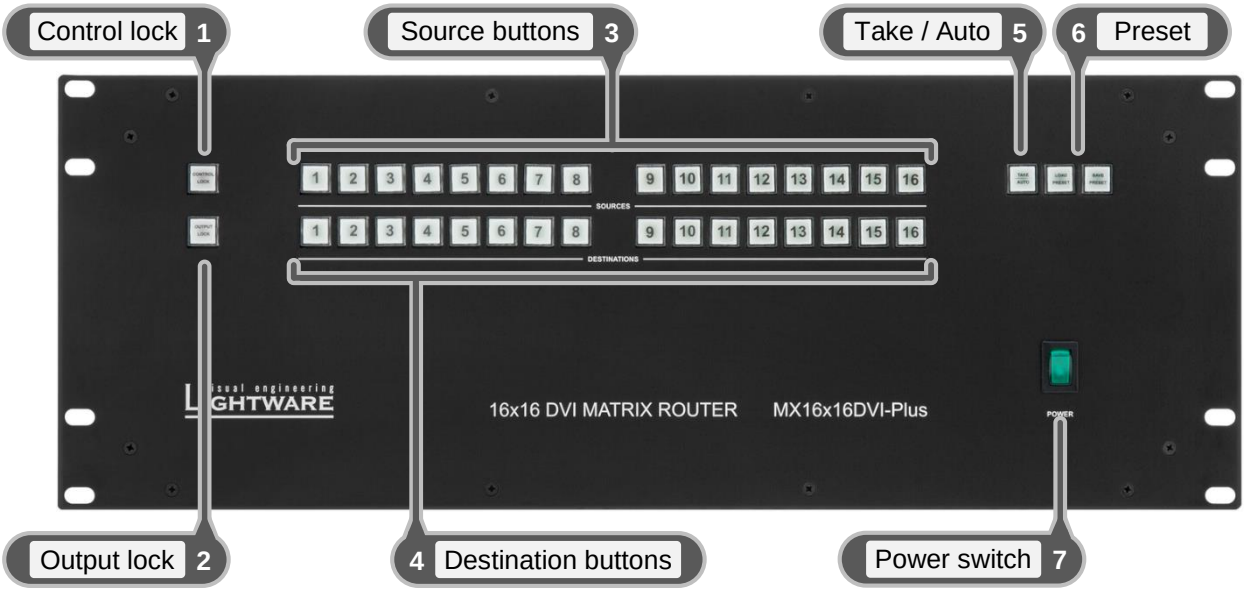


Figure 2-1. Front panel view

1	**Control Lock**	Disables or enables front panel operation. When red illuminated, all operations on front panel are prohibited. See section 4.2.1 on page 16 for more information.
2	**Output Lock**	Locks and protects one (or more) outputs. Inhibits accidental input changing on protected output. See section 4.2.8 on page 20 for more information.
3	**Source buttons**	Source buttons have three functions: to select an input, to select a preset and to view the selected input's state (only in TAKE mode). See section 4.2 on page 16 for more information.
4	**Destination buttons**	Destination buttons have two functions: to select an output and to view the selected output's state. See section 4.2 on page 16 for more information.
5	**Take / Auto**	Displays the actual switching mode of the router (TAKE or AUTOTAKE). Long press toggles the switching mode, short press executes switching in TAKE mode. See section 4.2.2 on page 16 for more information.
6	**Load Preset**	Loads and executes a previously saved preset from one of the preset memories.
	Save Preset	Stores actual matrix state in one of the preset memories. See section 4.2.7 on page 19 for more information.
7	**Power switch**	The matrix can be switched ON/OFF with the switch.

Info: MX12x12DVI-Plus front panel differs only in that it has 12 source and 12 destination buttons.

Info: MX9x9DVI-Plus front panel differs only in that it has 9 source and 9 destination buttons.

2.2. Rear view

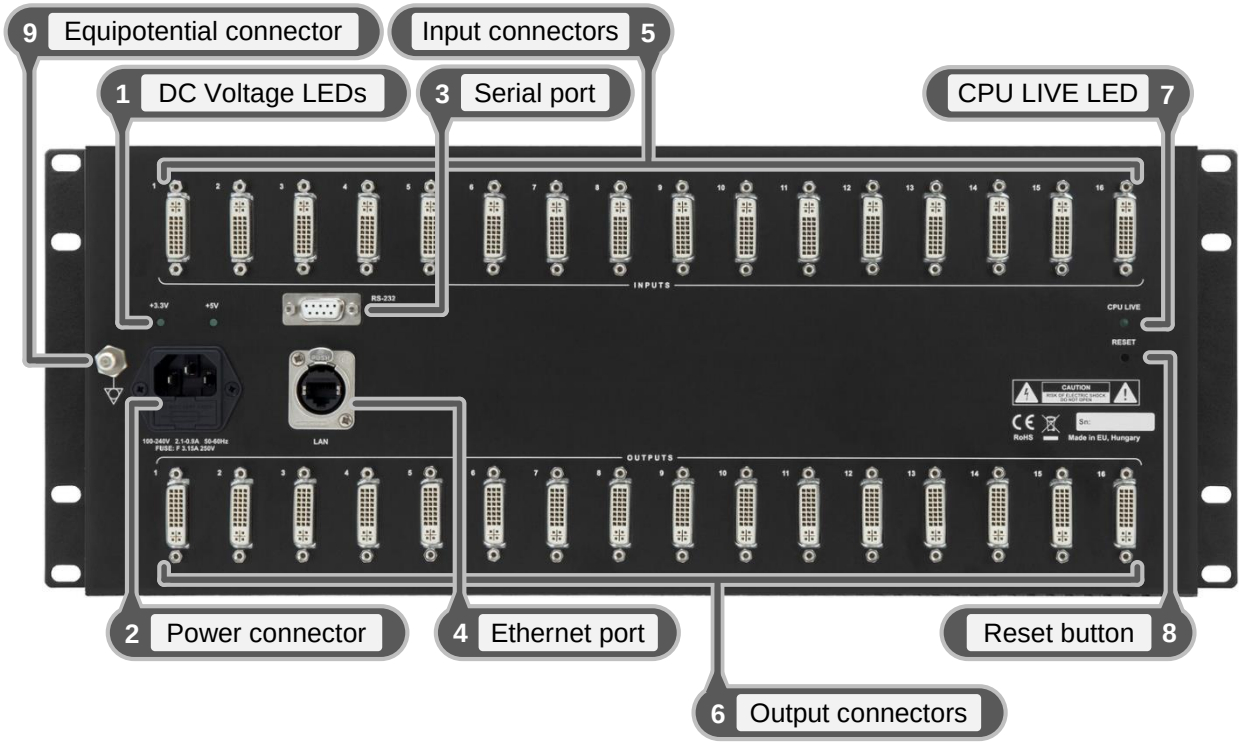


Figure 2-2. Rear view

1	**DC voltage indicators**	LED indicators for internal DC power voltages.
2	**Power connector**	Standard IEC-320 C14 power connector. The router works with 100 to 240 Volts, 50 or 60 Hz power sources. The fuse can be replaced with F3.15A type only!
3	**Serial port**	9 pole D-SUB female connector. Can be ordered with RS-232 or RS-422 control. See section 2.3.4 on page 13 for more information.
4	**Ethernet port**	Locking RJ45 connector. Remote control port for connecting the unit to Local Area Network (LAN). See section 2.3.5 on page 13 for more information.
5	**Input connectors**	29 pole DVI–I digital-only female receptacle connectors. Connect DVI source devices to these connectors. See section 2.3.1 on page 12 for more information.
6	**Output connectors**	29 pole DVI–I digital-only female receptacle connectors. Connect DVI sink devices to these connectors. See section 2.3.2 on page 12 for more information.
7	**CPU live LED**	Continuously blinking LED if the CPU works properly.
8	**Reset button**	Resets all internal hardware elements.
9	**Equipotential connector**	Plug connector for potential equalization. See section 2.3.3 on page 12 for more information.

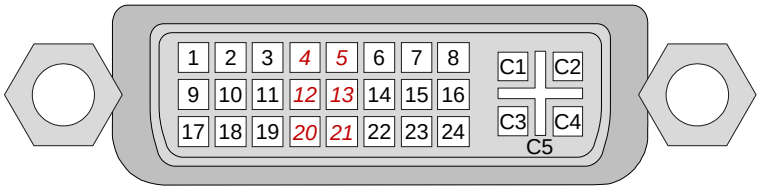
Info: MX12x12DVI-Plus rear panel differs only in that it has 12 input and 12 output connectors.

Info: MX9x9DVI-Plus rear panel differs only in that it has 9 input and 9 output connectors.

2.3. Electrical connections

2.3.1. DVI inputs

Standalone DVI-Plus matrices provide 29 pole DVI-I connectors for inputs, however only digital pins are internally connected. This way, users can plug in any DVI connector, but keep in mind that analog signals (such as VGA or RGBHV) are NOT processed. Fix +12 dB cable equalization is provided, this way DVI cables up to 20 meters can be used on all inputs. Always use high quality DVI cable for connecting sources and displays.



Pin	Signal	Pin	Signal	Pin	Signal
1	TMDS Data2-	**9**	TMDS Data1-	**17**	TMDS Data0-
2	TMDS Data2+	**10**	TMDS Data1+	**18**	TMDS Data0+
3	TMDS Data2 Shield	**11**	TMDS Data1 Shield	**19**	TMDS Data0 Shield
4	*nc*	**12**	*nc*	**20**	*nc*
5	*nc*	**13**	*nc*	**21**	*nc*
6	DDC Clock	**14**	+5V Power	**22**	TMDS Clock Shield
7	DDC Data	**15**	GND (for +5V)	**23**	TMDS Clock+
8	nc	**16**	Hot Plug Detect	**24**	TMDS Clock-
C1	nc	**C2**	nc	**C3**	nc
C4	nc	**C5**	GND		

Table 2-1. DVI-I digital only connector Single Link pin assignments

2.3.2. DVI outputs

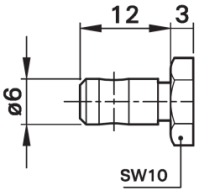
Standalone DVI-Plus matrices provide 29 pole DVI-I connectors for outputs, however only digital pins are internally connected. This way, users can plug in any DVI connector, but keep in mind that analog signals (such as VGA or RGBHV) are NOT processed. Thanks to the fix +6 dB pre-emphasizing circuit, DVI cables up to 15 meters can be used. For using longer cable runs at outputs, use fiber optical DVI transmitters (like Lightware DVI-OPT-TX110) or active DVI repeaters/extenders. No output reclocking is provided.

Fiber Cable powering

As a special feature standalone DVI-Plus matrices are able to supply 500 mA current on DDC +5V output (pin 14 on output connectors) to power fiber optical DVI cables. Standard DVI outputs or graphic cards supply only 55 mA current on +5V output, thus unable to power directly a fiber optical cable.

Info: The matrix switcher does not check if the connected sink supports Hotplug or EDID signals but outputs the selected signal immediately after switch command.

2.3.3. Equipotential connector



The purpose of additional potential equalization is to equalize potentials between different metal parts that can be touched simultaneously, or to reduce differences of potential which can occur during operation between the bodies of medical electrical devices and conductive parts of other objects. Ø6 mm plug made of nickel-plated brass can be found on the left side of the unit's back for potential equalization.

2.3.4. RS-232 / RS-422 control port

Lightware standalone DVI-Plus matrices can be remote controlled through industry standard 9 pole D-SUB female connector located on the rear panel of the unit. The router can be ordered with RS-232 or RS-422 control port.

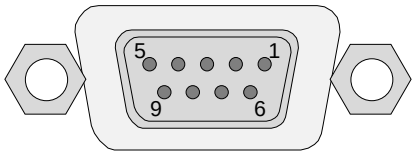


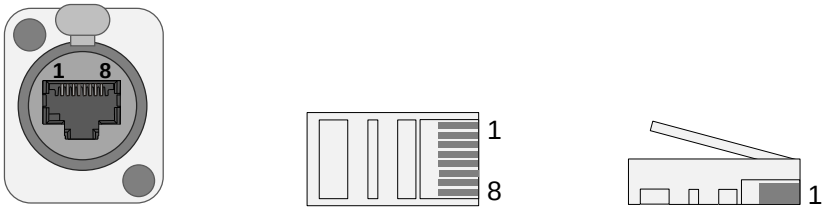
Figure 2-3. D-SUB 9 pole female connector (DE9F)

Pin nr.	RS-232	RS-422
1	NC - non connected	TX- data transmit complement
2	**TX data transmit (output)**	TX+ data transmit true
3	**RX data receive (input)**	RX+ data receive true
4	DTR (internally connected to Pin 6)	RX- data receive complement
5	**GND signal ground (shield)**	GND signal ground (shield)
6	DSR (internally connected to Pin 4)	NC - non connected
7	RTS (internally connected to Pin 8)	NC - non connected
8	CTS (internally connected to Pin 7)	NC - non connected
9	NC - non connected	NC - non connected

Table 2-2. D-SUB 9 pole pin assignments

2.3.5. Ethernet port

The matrix can be remote controlled via Ethernet as well. The matrix can be connected to a LAN hub, switch or router with a UTP patch cable. If connecting to a computer directly, a cross UTP cable has to be used! The robust Neutrik EtherCON connector ensures reliable connection, however normal RJ45 connectors can be used as well.



The recommended termination is based on TIA/EIA T 568 A or TIA/EIA T 568 B standards.

Pin	TIA/EIA T568 A	color and name	TIA/EIA T568 B	color and name
1		white/green stripe		white/orange stripe
2		green solid		orange solid
3		white/orange stripe		white/green stripe
4		blue solid		blue solid
5		white/blue stripe		white/blue stripe
6		orange solid		green solid
7		white/brown stripe		white/brown stripe
8		brown solid		brown solid

Table 2-3. Recommended termination of TP cables

3. Technologies

3.1. Understanding EDID

3.1.1. Basics

EDID stands for Extended Display Identification Data. Simply put, EDID is the passport of display devices (monitors, TV sets, projectors). It contains information about the display's capabilities, such as supported resolutions, refresh rates (these are called Detailed Timings), the type and manufacturer of the display device, etc.

After connecting a DVI source to a DVI display, the source reads out the EDID to determine the resolution and refresh rate of the image to be transmitted.

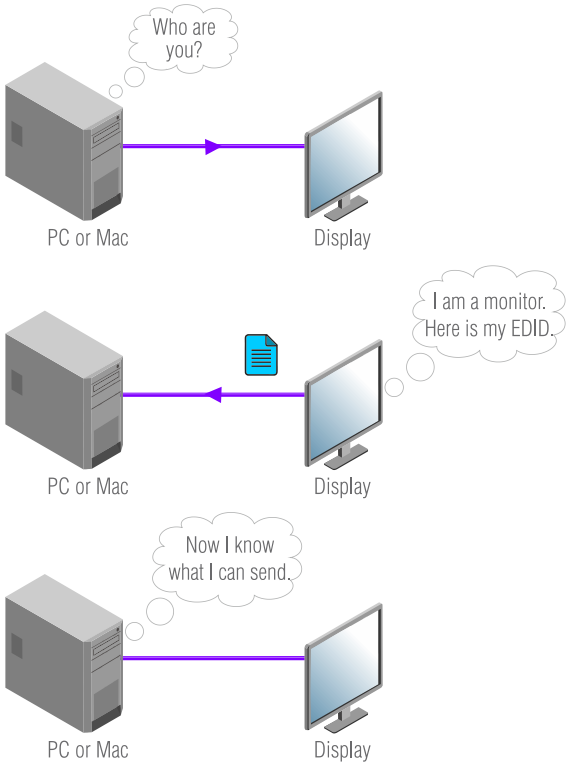


Figure 3-1. EDID communication

Most DVI computer displays have 128-byte long EDID structure. However, Digital Televisions and HDMI capable displays may have another 128 bytes, which is called E-EDID and defined by CEA (Consumer Electronics Association). This extension contains information about additional Detailed Timings, audio capabilities, speaker allocation and HDMI capabilities. It is important to know, that all HDMI capable devices must have CEA extension, but not all devices are HDMI capable which have the extension.

3.1.2. Common problems related to EDID

Problem: „My system consists of the following: a computer, a Lightware MX16x16DVI-Plus matrix, a WUXGA (1920x1200) LCD monitor, and an SXGA (1280x1024) projector. I would like to see the same image on the monitors and the projector. What EDID should I chose on the monitor and the projector?"

Solution: If you want to see the image on both displays, you need to select the resolution of the smallest display (in this case SXGA), otherwise the smaller display may not show the higher resolution image.

Problem: „I have changed to a different EDID on an input port of the matrix to have a different resolution but nothing happens."

Solution: Some graphics cards and video sources read out the EDID only after power-up and later they don't sense that EDID has been changed. You need to restart your source to make it read out the EDID again.

Problem: „I have an MX16x16DVI-Plus and I'm using a Lightware factory preset EDID. I would like to be able to choose from different resolutions, but my source allows only one resolution."

Solution: Most Lightware factory preset EDIDs allow only one resolution, forcing the sources to output only that particular signal. You need to select a Universal EDID. It supports all common VESA resolutions. Additionally it also features audio support.

3.2. Advanced EDID Management

Each DVI sink (e.g. monitors, projectors, plasma displays, and switcher inputs) must support the EDID data structure. Source BIOS and operating systems are likely to query the sink using DDC2B protocol to determine what pixel formats and interface are supported. HDMI standard makes use of EDID data structure for the identification of the monitor type and capabilities. Most DVI sources (graphic cards, set top boxes, etc.) will output DVI signal after accepting the connected sink's EDID information. In case of EDID readout failure or missing EDID the source will not output DVI video signal. MX16x16DVI-Plus provides Lightware's Advanced EDID Management function that helps system integration. The built in EDID Router stores and emulates 100 EDID data plus all monitor's EDID that are connected to the output connectors. First 50 EDID are factory presets, while memories 51 to 100 are user programmable. The router stores the EDID of all attached monitors or projectors for each output in a non-volatile memory. This way the EDID from a monitor is available when the monitor is unplugged, or switched off.

Any EDID can be emulated on any input. An emulated EDID can be copied from the EDID router's memory (static EDID emulation), or from the last attached monitors memory (dynamic EDID emulation). For example, the router can be set up to emulate a device, which is connected to one of the outputs. In this case the EDID automatically changes, if the monitor is replaced with another display device (as long as it has a valid EDID).

EDID is independently programmable for all inputs without affecting each other. All input has its own EDID circuit. EDID Router can be controlled via serial port or Ethernet.

Info: The user is not required to disconnect the DVI cable to change an EDID as opposed to other manufacturer's products. EDID can be changed even if a source is connected to the input and it is powered ON.

Info: When EDID has been changed, the router toggles the HOTPLUG signal for 2 seconds. Some sources do not observe this signal, so in this case the change is not recognized by the source. In such cases the source device must be restarted or powered OFF and ON again.

4. Operation

4.1. Power

Connect the power cord to the router's standard IEC-320 C14 AC power input connector. The unit can be switched ON/OFF with the front panel rocker switch. When it is on, the switch illuminates, and the fan operates.

After powered on, the unit performs a self-test, and then all front panel buttons light up for one second. After the self-test the CPU live LED starts blinking, the router reloads its last configuration and it is ready to use.

Info: After switching ON, the router reloads the latest settings which had been used before it was turned off. The router has an internal emergency memory that stores all current settings and tie configurations. That memory is independent from presets and invisible for the user. This built-in feature helps the system to be ready immediately in case of power failure or accidental power down.

4.2. Front panel operations

4.2.1. CONTROL LOCK

Front panel button operations can be enabled or disabled using CONTROL LOCK button, while RS-232 / RS-422 and Ethernet control is still enabled. If the button is not illuminated, front panel button operations are enabled. If it illuminates red continuously, front panel operations are inhibited.

Press and release the CONTROL LOCK button to toggle the control lock state.

4.2.2. TAKE / AUTOTAKE modes

The router has two different switching modes: TAKE and AUTOTAKE. If the TAKE / AUTO button is unlit, TAKE mode is active. When the TAKE / AUTO button continuously lights green, AUTOTAKE mode is selected.

Press and hold the TAKE / AUTO button for three seconds to toggle between TAKE and AUTOTAKE modes.

TAKE mode allows the user to connect or disconnect multiple outputs to an input at once. This mode is useful when time delay is not allowed between multiple switching. The commands are only realized when the TAKE button is pressed. If no button is pressed for two seconds, all preselected actions (which were not realized with the pressing TAKE) will be ignored, and the router returns to its idle state.

AUTOTAKE mode is useful when immediate actions must be done or fast switching is needed between sources on a particular destination. In this mode switching occurs immediately upon pressing one of the input selector buttons.

4.2.3. SOURCE and DESTINATION buttons

Input and output ports have dedicated buttons on the front panel. These buttons are labeled with numbers and have backlight to indicate active or selected ports. These are referred as SOURCES and DESTINATIONS buttons.

4.2.4. Viewing crosspoint state

User can check the current switching status on the front panel using front panel buttons. This status view feature is slightly different in TAKE or AUTOTAKE modes because of different switching philosophy of the two modes.

Info: Status view occurs whenever the router has to be switched. After entering the view state, the user can change the routing configuration. Viewing and switching can be done after each other, or if nothing is pressed for three seconds, the router returns to idle state.

View current state in TAKE mode

If all source and destination buttons and TAKE button are unlit (the unit is in TAKE mode, and no input was selected in last 3 seconds), user can verify both input and output connections. This informative display will remain for 3 seconds, and then all button lamps go out. In TAKE mode no accidental change can be done unless TAKE button is pressed.

For viewing **input connections**, press and release a source button. Now the selected source button and all destination buttons will light up which are currently connected to the selected source.

For viewing **output connections**, press and release a destination button. Now the source button which is connected to the selected destination will light up. If no source button is lighting, the selected destination is in muted state.

View current state in AUTOTAKE mode

In AUTOTAKE mode only states of destinations can be viewed.

Press and release the required destination button. Now the source button which is connected to the selected destination will light up. If no source button is lighting, the selected destination is in muted state. By pressing another destination button, the state of that destination can be seen.

Info: Be careful, as in AUTOTAKE mode if a source button is pressed, it is immediately connected to the last selected destination.

4.2.5. Switching

Creating a connection or multiple connections in TAKE mode

Step 1. First press and release the selected source button. The pressed source button and all destination buttons which are currently connected to this source will light up. The dark remaining destination buttons are not connected to this source. This is an informative display about current status of the selected input (view only).

Step 2. Press and release the selected destination button or buttons which has to be connected to the selected source. The preselected destination button(s) start(s) blinking.

Step 3. Press and release TAKE button to execute the tie or ties. Now the selected input is switched to the selected output or to the multiple outputs.

Info: If the pressed destination is locked then it could not be selected. This is indicated by a short flash of the OUTPUT LOCK when a locked destination is pressed.

Disconnecting or muting in TAKE mode

Step 1. First press and release the selected source button. The pressed source button and all destination buttons which are currently connected to this source will light up. The dark remaining destination buttons are not connected to this source. This is an informative display about current status of the selected input (view only).

Step 2. Press and release the selected, green lighting destination button which has to be disconnected from the selected source. The pressed destination or multiple destinations will turn dark.

Step 3. Press and release TAKE button to execute disconnection.

Info: Deselected destinations are disconnected from any source, thus output devices will display black image or "no signal" message, or automatically will turn off.

Info: If the pressed destination is locked then it could not be deselected. This is indicated by a short flash of the OUTPUT LOCK when a locked destination is pressed.

Info: Multiple switching and deselecting actions can be done simultaneously, during only one TAKE action.

Creating a connection in AUTOTAKE mode

Step 1. Press and release the selected destination button. The pressed destination button, and the actually connected source button light up green. If no source is connected (the output is muted) no source button will light up.

Step 2. Press and release the selected input button. The switch action will be executed immediately. Switching between sources to the selected destination can be done directly.

Info: If the pressed destination is locked then sources could not be selected. This is indicated by a continuously light of the OUTPUT LOCK when a locked destination is pressed.

Deselecting or muting in AUTOTAKE mode

Step 1. Press and release the selected destination button. The pressed destination button, and the actually connected source button are lighting green. If no source is connected (the output is muted) no source button will light up.

Step 2. Press and release the active green lighting source button. The output is muted.

Info: Deselected destinations are disconnected from any source, thus output devices will display black or blue image or "no signal" message and may automatically turn off.

Info: If the pressed destination is locked then sources could not be deselected. This is indicated by a continuously light of the OUTPUT LOCK when a locked destination is pressed.

4.2.6. Switching operations flowchart

To better understand the viewing and switching sequence in TAKE and AUTOTAKE modes, please study the below diagrams.

TAKE mode

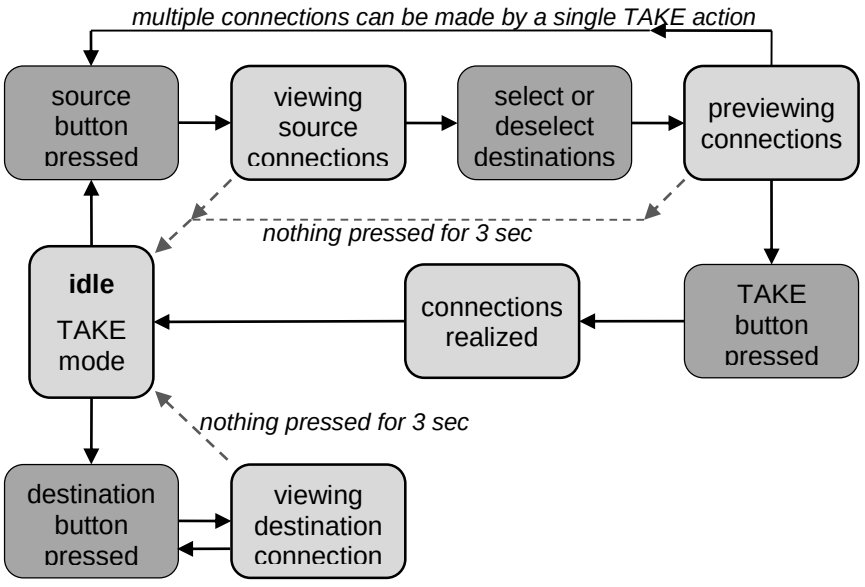


Figure 4-1. Switching flowchart in TAKE mode

AUTOTAKE mode

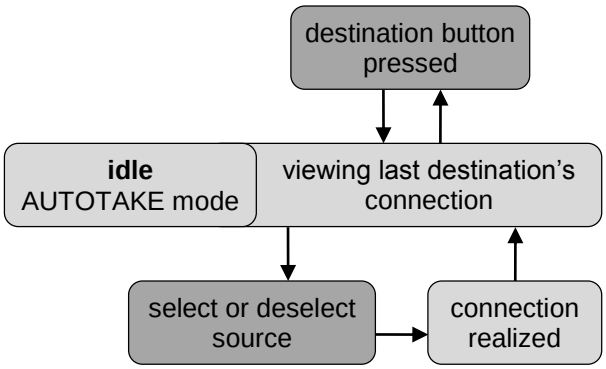


Figure 4-2. Switching flowchart in AUTOTAKE mode

4.2.7. Preset operations

Lightware matrices have 32 user programmable presets. Each preset stores a configuration regarding all input connections and mute state for all outputs. All presets are stored in a non-volatile memory; the router keeps presets even in case of power down. Memory numbers are assigned to source buttons. The higher numbered presets are accessible only through software control.

Info: Preset save action always stores the current configuration for all outputs including mute state, but ignoring lock state.

Info: Loading a preset modifies all output states that are not currently locked.

Saving a Preset in TAKE mode

Step 1. Create the desired connections which have to be saved.

Step 2. Press and release the SAVE PRESET button.

Step 3. Press and release a source button according to the desired memory address (source 1 to 16 or 12 or 9).

Step 4. Press and release TAKE button; the configuration is stored in the selected memory.

Loading a Preset in TAKE mode

Step 1. Press and release LOAD PRESET button.

Step 2. Press and release a source button according to the desired memory address (source 1 to 16 or 12 or 9).

Step 3. Press and release TAKE button. Now the selected preset is loaded.

Saving a Preset in AUTOTAKE mode

Step 1. Create the desired connections which have to be saved.

Step 2. Press and release SAVE PRESET button.

Step 3. Press and release a source button according to the desired memory address (source 1 to 16 or 12 or 9). The configuration is stored in the selected memory.

Loading a Preset in AUTOTAKE mode

Step 1. Press and release LOAD PRESET button.

Step 2. Press and release a source button according to the desired memory address (source 1 to 16 or 12 or 9). Now the selected preset is loaded.

4.2.8. OUTPUT LOCK

A destination's state can be locked; this feature prevents an accidental switching to the locked destination in case of important signal. Locking a destination means, that no input selection or muting can be executed on that particular destination. Destinations can be independently locked or unlocked. Locking a destination does not affect other destinations.

View locked outputs in TAKE mode

Step 1. Press and release the Output Lock button.

Step 2. The Output Lock button starts to blink and all the buttons of any locked destinations light up, and remain illuminated for three seconds.

Lock an output in TAKE mode

Step 1. Press and release the Output Lock button.

Step 2. Now the Output Lock button starts to blink and all the locked output's buttons illuminate green (view state).

Step 3. If no button is pressed for three seconds, the router returns to idle state.

Step 4. If an unlit output button is pressed, it starts to blink, to indicate that it is preselected for output locking.

Step 5. Press and release TAKE button. The selected destinations are now locked.

Unlock an output in TAKE mode

Step 1. Press and release the Output Lock button.

Step 2. Now the Output Lock button starts to blink and all the locked output's buttons illuminate green (view state).

Step 3. If no button is pressed for three seconds, the router returns to idle state.

Step 4. If an illuminating output button is pressed, it goes off, to indicate that it is preselected for unlocking.

Step 5. Press and release the TAKE button. The deselected destinations are now unlocked.

View locked outputs in AUTOTAKE mode

In AUTOTAKE mode a destination is selected all the time. Therefore the currently selected output and input buttons are illuminated. The Output Lock button illuminates regarding to the lock state of the current output.

Viewing all locked outputs is not possible in AUTOTAKE mode, as pressing the Output Lock button instantly locks or unlocks the current output.

Lock an output in AUTOTAKE mode

Step 1. Press and release the required destination button. Now the selected destination button and the currently configured source button light up (view mode).

Step 2. Press and release the Output Lock button. Now the Output Lock button lights up in red, and lock function is activated at once. No source can be changed at the locked destination.

Unlock an output in AUTOTAKE mode

Step 1. Press and release the required destination button which was previously locked. Now the selected destination button and the currently configured source button and the Output Lock button light up.

Step 2. Press and release the Output Lock button (deselect). Now the Output Lock button turns off, and the locking function has been cancelled.

4.3. Remote operation

Lightware matrix routers can be controlled through various interfaces remotely. This makes possible to use such functions that are not accessible via the front panel. Also, this helps system integrators and operators to control multiple devices in a big system through a single user interface.

4.3.1. Control interfaces

Users can connect to the matrix through

- Ethernet (TCP/IP),
- Serial port (RS-232 or RS-422).

The available remote connections and the relating chapters are listed below.

User interface	Connection type		further information
	Ethernet port	Serial port	
Lightware Device Controller software	✓	✓	chapter 5 page 24
Built-in website	✓	no	chapter 6 Page 42
Third party control system	✓	✓	chapter 8 Page 52

Table 4-1. Available remote connections

Info: Ethernet port can be connected to a LAN hub, switch or router with a UTP patch cable. If connecting to a computer directly, a crosslink UTP cable has to be used!

4.3.2. User interface comparison

The built-in website and the Lightware Device Controller software have little different capabilities. The table below summarizes the main differences, helping you to select the interface that suits your needs.

Function	Lightware Device Controller (LDC)	Built-in website
Platform	Windows or Mac	ANY ✓
Installation	Installation required	Web browser needed only ✓
I/O and preset names	✓	No
Preview presets	✓	No
Easy EDID creator	✓	No
EDID editor	✓	No
EDID upload / download	✓	No

Table 4-2. User interface comparison

4.3.3. Multiple simultaneous connections

The matrix allows simultaneous remote control over multiple interfaces. Web control, Lightware Device Controller Software over Ethernet and Lightware Device Controller Software with serial connections can be used at the same time.

4.3.4. Serial port settings

Standalone DVI-Plus matrices can be ordered with either RS-232 or RS-422 communication port. The port settings are done in the factory. D-SUB connector pin assignments can be found in chapter 2.3.4 on page 13.

The device uses standard RS-232 or RS-422 interface with the following settings:

- 9600 Baud,
- 8 data bit,
- 1 stop bit,
- No parity,
- Straight serial cable.

4.3.5. IP settings

The Ethernet port can be configured remotely through Lightware Device Controller Software or the built-in website.

The factory default IP settings or DHCP mode can be activated quickly through front panel shortcut buttons. To reset the IP configuration perform the following:

Resetting the IP address

Reset to factory default IP configuration or to DHCP mode with front panel buttons.

Step 1. Switch the router to TAKE mode if used previously in AUTOTAKE mode by pressing TAKE button for 3 seconds (light will go off).

Step 2. Press and release Control Lock button (it lights in up red continuously).

Step 3. Press and keep pressed the Output Lock button (the current protocol indication will light up).

Step 4. Press and release the

a) **Load Preset** button to set the **factory default IP** settings

IP address:	192.168.254.254
port number:	10001
subnet mask:	255.255.0.0
gateway:	0.0.0.0

b) **Save Preset** button to set **DHCP enabled**

IP address:	Acquired with DHCP
port number:	unchanged
subnet mask:	Get from DHCP server
gateway:	Get from DHCP server

Step 5. A light sequence will occur to confirm the command. (Take/Auto, Load Preset and Save Preset buttons will light up one after the other)

Step 6. Reinsert the LAN cable to the Ethernet port if it was unplugged.

Step 7. Wait about 20 seconds before connecting the router via Ethernet.

4.3.6. Control protocols

Matrix routers can be controlled with multiple control protocols. Lightware routers have a special protocol, but to interoperate with third party devices, a secondary protocol is also provided.

Info: Lightware Device Controller software and the built-in website works only with LW protocol (#1)!

The currently used protocol can be viewed or changed any time on the matrix front panel or with protocol commands.

Change (view) protocol on the front panel

Step 1. Switch the router to TAKE mode if used previously in AUTOTAKE mode by pressing TAKE button for 4 seconds. (light will go off)

Step 2. Press and release Control Lock button (it lights in up red continuously)

Step 3. Press and keep pressed the Output Lock button. Now the active protocol is displayed: (view protocol) One source button lights up according to the current protocol:

- Source#1 lights: Lightware protocol is active
- Source#2 lights: Protocol#2 is active

Step 4.

a) If you do not want to change the protocol, release the Output Lock button (view only).

b) If you want to change the protocol keep the Output Lock button pressed, and press the desired Source button.

Change (view) protocol via remote connection

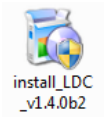
Connect to the matrix through any control interface, then use the commands described in section 8.6.7 and 8.6.8 on page 64.

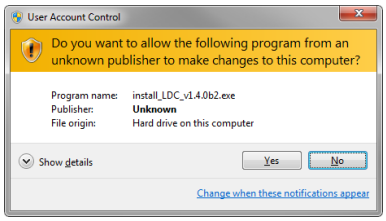
5. Software control – Using Lightware Device Controller (LDC)

The matrix can be controlled by a computer through Ethernet or RS-232 port using Lightware Device Controller. The software can be installed to a Windows PC or MAC OS X. The application and the User's manual can be downloaded from www.lightware.eu. The Windows and the Mac versions have the same look and functionality.

5.1. Steps of the installation in case of Windows OS

Step 1. Run *Install_LDC_v1.0.4b2.exe*
If the User Account Control drops a popup message click Yes.

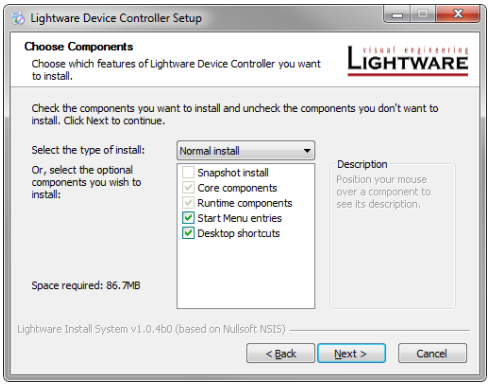


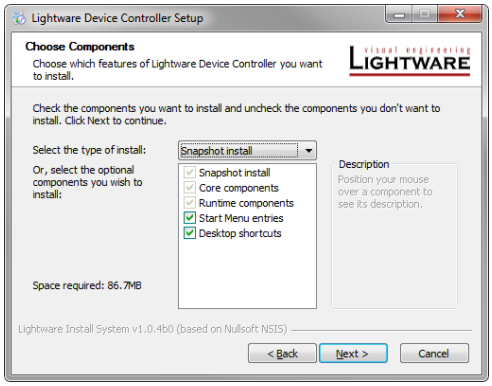

User Account Control
Do you want to allow the following program from an unknown publisher to make changes to this computer?
Program name: install_LDC_v1.4.0b2.exe
Publisher: Unknown
File origin: Hard drive on this computer
Show details
Yes
No
Change when these notifications appear

Step 2. A welcome window opens. Click Next.

Lightware Device Controller Setup
LIGHTWARE
Welcome to Lightware Device Controller Setup
Setup will guide you through the installation of Lightware Device Controller.
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.
Click Next to continue.
LIGHTWARE DEVICE CONTROLLER
Next >
Cancel

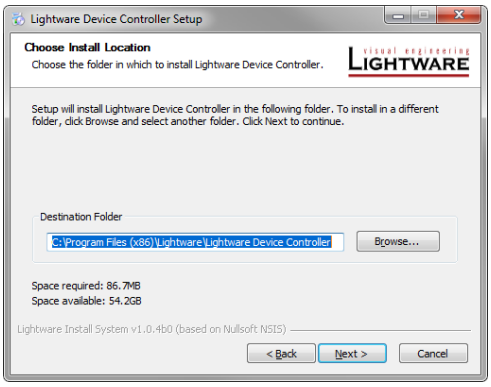
Step 3. Select the type of the installation. Here can be chosen the normal and the snapshot install. Select the optional components then click Next.
(Using the Normal install as the default value is highly recommended.)


Lightware Device Controller Setup
Choose Components
Choose which features of Lightware Device Controller you want to install.
LIGHTWARE
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select the type of install:
Normal install
Or, select the optional components you wish to install:
Snapshot install
Core components
Runtime components
Start Menu entries
Desktop shortcuts
Description
Position your mouse over a component to see its description.
Space required: 86.7MB
Lightware Install System v1.0.4b0 (based on Nullsoft NSIS)
< Back
Next >
Cancel

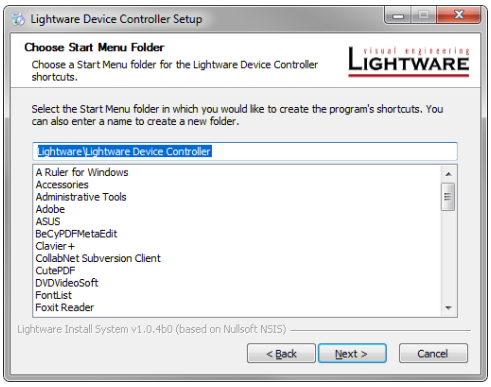

Lightware Device Controller Setup
Choose Components
Choose which features of Lightware Device Controller you want to install.
LIGHTWARE
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select the type of install:
Snapshot install
Or, select the optional components you wish to install:
Snapshot install
Core components
Runtime components
Start Menu entries
Desktop shortcuts
Description
Position your mouse over a component to see its description.
Space required: 86.7MB
Lightware Install System v1.0.4b0 (based on Nullsoft NSIS)
< Back
Next >
Cancel

Normal install	Snapshot install
Available for Windows and MAC OS X	Available for Windows
The installer can update only this instance	Cannot be updated
Only one updateable instance can exist for all users	More than one different version can be installed for all users
Does not contain the version in its name	Version number is displayed in the name

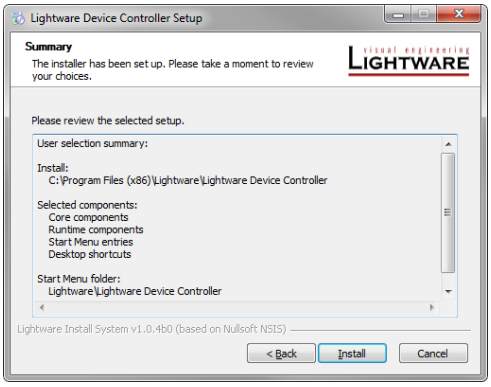
Step 4. Select the destination folder and click Next. (Using the default path is highly recommended.)


Lightware Device Controller Setup
Choose Install Location
Choose the folder in which to install Lightware Device Controller.
LIGHTWARE
Setup will install Lightware Device Controller in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Destination Folder
C:\Program Files (x86)\Lightware\Lightware Device Controller
Browse...
Space required: 86.7MB
Space available: 54.2GB
Lightware Install System v1.0.4b0 (based on Nullsoft NSIS)
< Back
Next >
Cancel

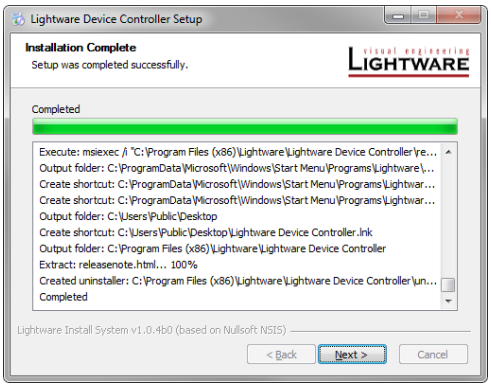
Step 5. Select the Start Menu Folder and click Next. (Using the default folder is highly recommended. If the Start menu entries was not checked in the Step 2. this window will be skipped.)



Step 6. Verify the settings and if they are correct click Install. (If not, click Back and change the setting.)



Step 7. After the installation of the last component the Next button is activated. Click on it.



Step 8. If the installation is complete, click Finish. (Uncheck the box if the running of the LDC will be delayed.)

5.2. Steps of the installation in case of Mac OS X

Info: After the installation the Windows and the Mac application has the same looks and functionality.

Step 1. Mount the DMG file with double clicking on it.

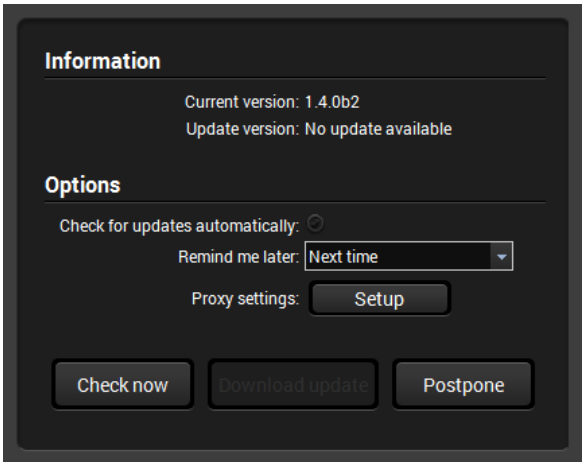
Step 2. Drag the LDC icon over the Applications icon to copy the program into the Applications folder. If you want to copy the LDC into another location just drag the icon over the desired folder.

Info: This type of the installer is equal with the Normal install in case of Windows This is an updateable version with the same attributes.

5.3. LDC Upgrade

Step 1. Run the application.

The Device Discovery window appears automatically and the program checks the available updates on Lightware's website and opens the update window if the LDC found updates.



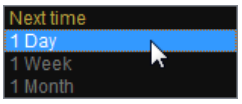
The current and the update version number can be seen in the top of the window and they are shown in this window even with the snapshot install.

The update window can be also opened by clicking the About and the Update button.

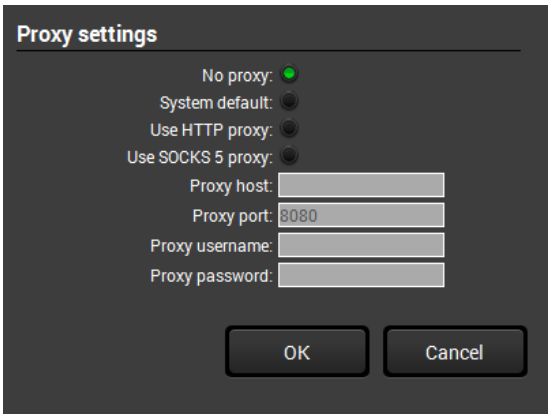
Step 2. Set the desired update setting in the option section.

a) If you do not want to check for the updates automatically, uncheck the circle, which contains the green tick.

b) If you want to postpone the update, a reminder can be set with different delays from the drop-down list.



c) If the proxy settings traverse the update process, set the proper values then click the OK button.



Step 3. Click the Download update button to start the upgrading.

User can check updates manually by clicking the Check now button.

5.4. Establishing the connection

Step 1. Connect the device to a computer via an USB cable.

Step 2. Run the controller software; device discovery window appears automatically.

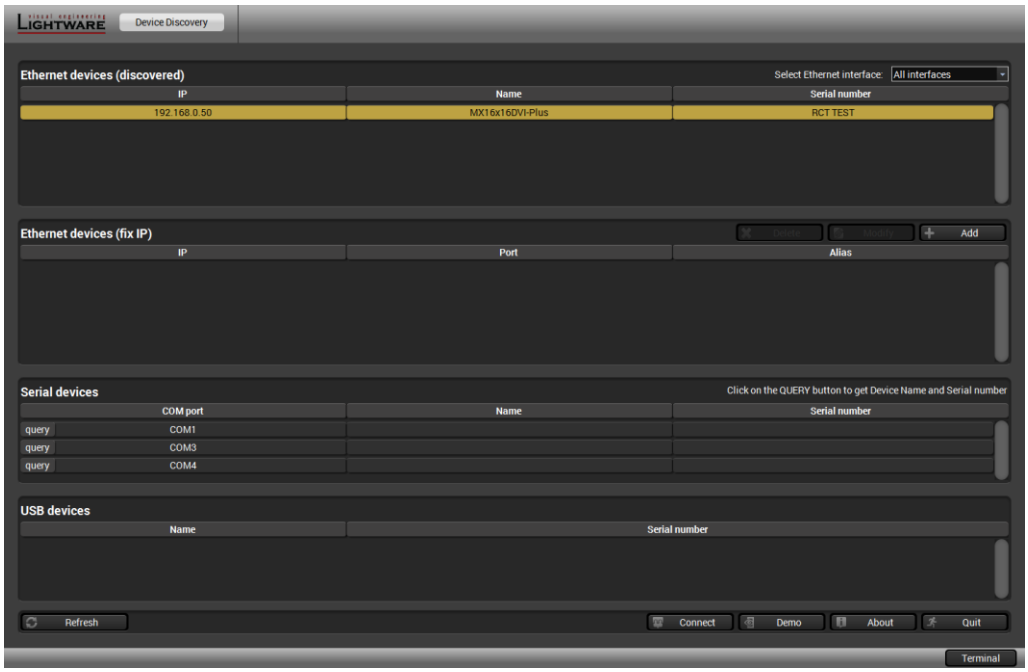
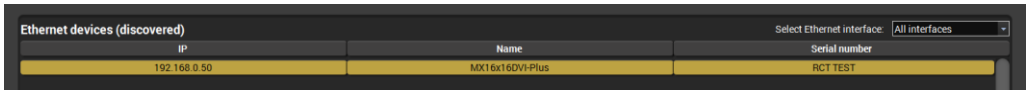


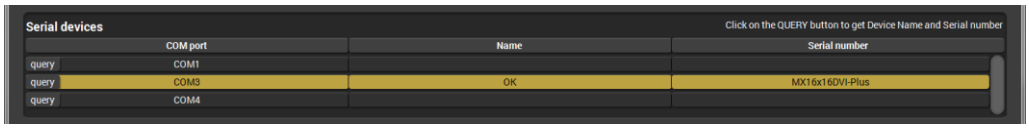
Figure 5-1. Ethernet connection in Device discovery window

Step 3. Select the matrix:

a) If the connection is made via Ethernet, find the matrix under Ethernet devices; click on the Connect button:

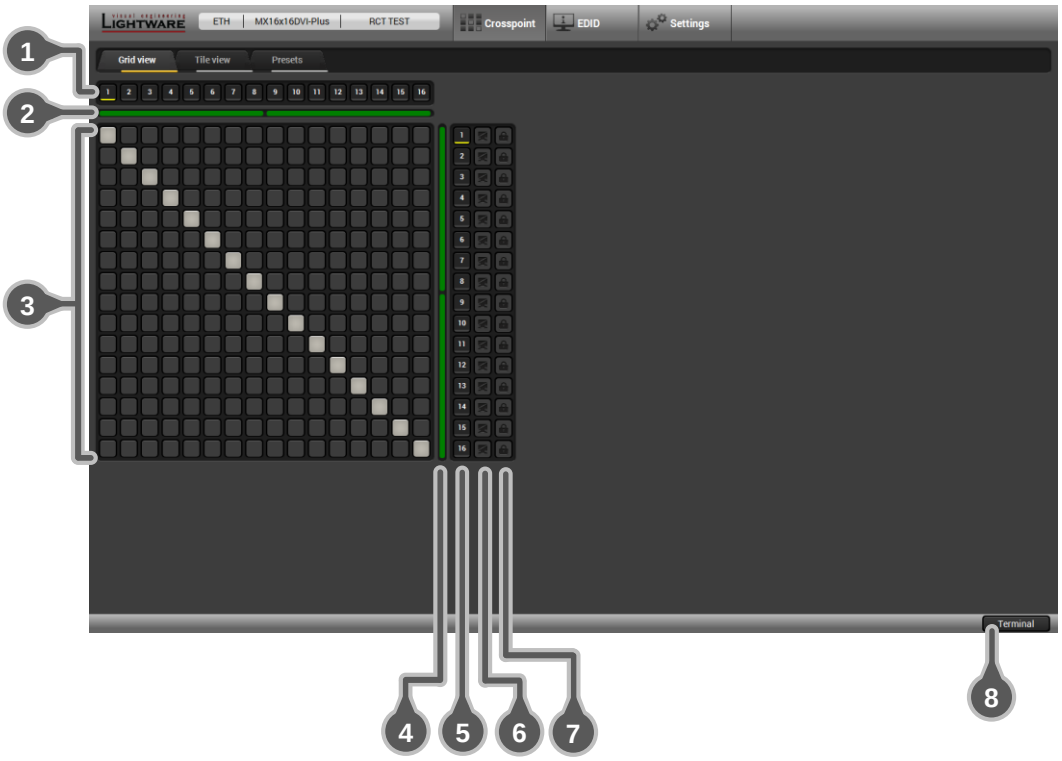


b) If the connection is made via RS-232, click on the Query button next to the appropriate COM port. The name and the serial number of the matrix is loaded. Select the device and click on connect button:



5.5. Crosspoint menu, Grid view

In this view, the current state of the crosspoint switch is displayed. The grid view depends on the device's type and size.



1	Input ports	Each number represents an input port. The yellow bar on the bottom means signal is present. If the window size does not allow to display all the ports, pages can be turned by the left and right arrow buttons of the navigator.
2	Type of input board	The color of the line shows what kind of input board is installed. Green color means MX-DVID board.
3	Connections	Dark grey square means the port is not available. Light grey square means the port is available but no connection between the input and the output. White square means there is a connection between the input and the output port.
4	Type of output board	The color of the line shows what kind of output board is installed. Green color means MX-DVID board.
5	Output ports	Each number represents an output port. The yellow bar on the bottom means sink is connected. If the window size does not allow to display all the ports, pages can be turned by the up and down arrow buttons of the navigator.
6	Mute buttons	Outputs can be easily muted by clicking on the mute button.
7	Lock buttons	For the prevention of the unwanted switching, outputs can be locked to any input.
8	Terminal	This general-purpose terminal is created mainly for testing and debugging purposes. (For more information, see section 5.10 on page 41.)

5.5.1. Crosspoint operations

Switching

To make a connection click on the desired square. If there is no connection between the desired input and output (the square is dark grey), the mouse pointer becomes a hand (link pointer) before the clicking. If the output port is not locked, then the connection is made, the square becomes white and the cursor is changed back to a pointer.

E.g. input 16 is not connected to output 2 according to the first picture above. After the connection the square becomes light grey.

Muting outputs

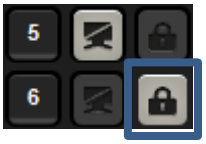
Outputs can be easily muted by clicking on the button figured a crossed monitor beside the output. This means that no signal is present at this output. If mute is active, the color of the button's background changes to white.

Info: Switching muted outputs does not unmute them, muting remains active until mute button is clicked again.

Info: Outputs can be disconnected from any inputs (by protocol command). In this case the crosspoint view will not show any white square for the disconnected output and the output will have no signal just like when muted. Click on a crosspoint square to connect the output again to an input.

Locking outputs

Outputs can be locked to any input. After locking an input to an output, no switching is permitted to this output unless it is unlocked again. If output lock is active, the color of the button's background changes to white.



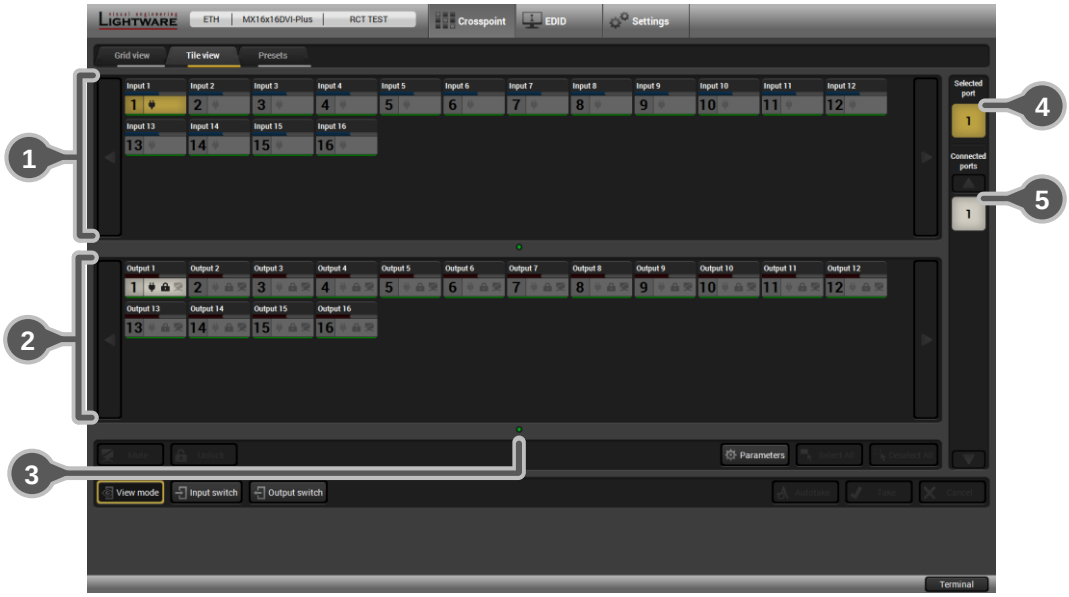
Info: Loading a preset does not change either the lock state or the switch state of a locked output. If an output is locked to an input before preset loading it will also be locked to that input after preset loading, so locked outputs ignore the preset.

5.6. Crosspoint menu, Tile view

In Tile view the input and output ports are displayed by tiles, which additionally shows the most important port and signal information. Thus, user can check the status of many ports at the same time without clicking on a port or opening port settings window.

Three display modes are defined in Tile view for matrices:

- View mode,
- Input switch mode and
- Output switch mode.



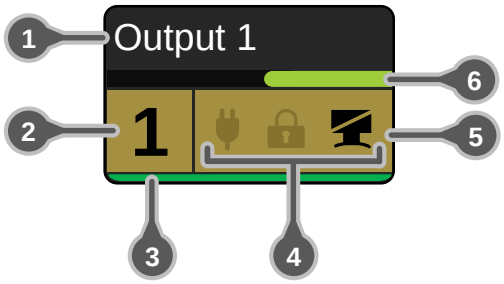
1	Input ports	Each tile represents an input port.
2	Output ports	Each tile represents an output port.
3	Page indicator	Current page is displayed with green dot; if other pages exist, they are displayed with black dots.
4	Selected port	Last selected port is displayed with yellow background on the port bar. Press the button to open port settings window.
5	Connected port(s)	Those ports are listed (with white background) on the port bar, which are connected to the Selected port.

Control buttons

Mute	Mute or unmute selected output port(s)	Parameters	Open port settings window
Lock	Lock or unlock selected output port(s)	Select All	Select all ports (only in output switch mode)
View mode	Activate View mode	Deselect All	Deselect all ports (only in output switch mode)
Input switch	Activate Input switch mode	Autotake	Toggle Autotake mode ON/OFF
Output switch	Activate Output switch mode	Take	Execute crosspoint changes in Take mode

5.6.1. Port tiles

The colors of the port tiles and the displayed icons represent different states and information about selected port:

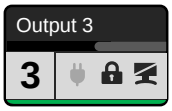


1. Port name
2. Port number
3. Board type (green means MX-DVID)
4. State indicators
5. Background color
6. Signal present (green), not present (grey)

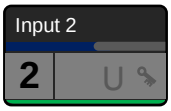
Background colors (port state)

The colors of the port tiles represent different states of the port as follows:

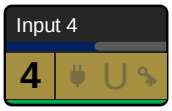
Dark grey
Port is not available (no board is installed)



White
Connected port



Light grey
Port is available



Yellow
Selected port

State indicators

Icon	Icon is not displayed	Icon is grey	Icon is black
	No information is available about connection status	Port is available but inactive	Port is available and sink / source is connected (hotplug / power +5V detected)
	-	Port is unlocked	Port is locked
	-	Port is unmuted	Port is muted

5.6.1. View mode

This mode was designed to display crosspoint state of a selected- and its connected port(s).

Info: Crosspoint settings cannot be changed in View mode but port settings are available.

5.6.2. Crosspoint operations

Crosspoint changes can be made in Input switch mode and Output switch mode. The working method is the same in both cases but the priority is different.

Input switch mode

The mode can be also named as 'Input priority-mode'. In the mode an input port has to be selected at first then the connected output port(s) is/are shown. Thus, the output port(s) connected to the input port can be changed.

Output switch mode

The mode can be also named as 'Output priority-mode': an output port has to be selected at first then connected input port is shown. Thus, the output port connected to the input port can be changed.

Info: Output ports can be (un)locked, (un)muted only in Output switch mode.

Switching operations

Take mode

If the Autotake button is outlined with **black** color Take mode is active. In Take mode any crosspoint change – (dis)connect ports to/from the previously selected port – is executed only after pressing the Take button. Following steps describe the process of the switching:

Step 1. Press the desired Input switch or Output switch button to select switching mode.

Step 2. Select the desired port; it will be highlighted with yellow color and displayed on the port bar on the right, too.

Step 3. Connected port(s) is/are highlighted with white color and displayed on the port bar on the right, too.

Step 4. Create the desired crosspoint settings by (de)selecting the ports; they will start to blink.

Step 5. Press Take button to execute changes or Cancel to ignore the operations.

Info: Take mode remains active until it is switched off. Selecting another view mode or menu does not change the Take/Autotake mode state.

Autotake mode

If the Autotake button is outlined with **yellow** color Autotake mode is active. In this mode any crosspoint change – (dis)connect ports to/from the previously selected port – is executed immediately after pressing the port button. Following steps describe the process of the switching:

Step 1. Press the desired Input switch or Output switch button to select switching mode.

Step 2. Select the desired port; it will be highlighted with yellow color and displayed on the port bar on the right, too.

Step 3. Connected ports are highlighted with white color and displayed on the port bar on the right, too.

Step 4. Create the desired crosspoint settings by (de)selecting the ports; the changes are executed immediately.

Info: Autotake mode remains active until it is switched off. Selecting another view mode or menu does not change the Take/Autotake mode state.

Port settings

Press the desired port button on the port bar on the right; a window pops up where the current port name can be set.

Info: Settings of the selected port are also available by pressing the Parameters button.

5.7. Presets

Preset operations can be done in Crosspoint submenu on the Preset tab. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved at any time.

Info: A preset setting stores a full configuration of all outputs, so preset loading have an effect on every output, except the locked ones.

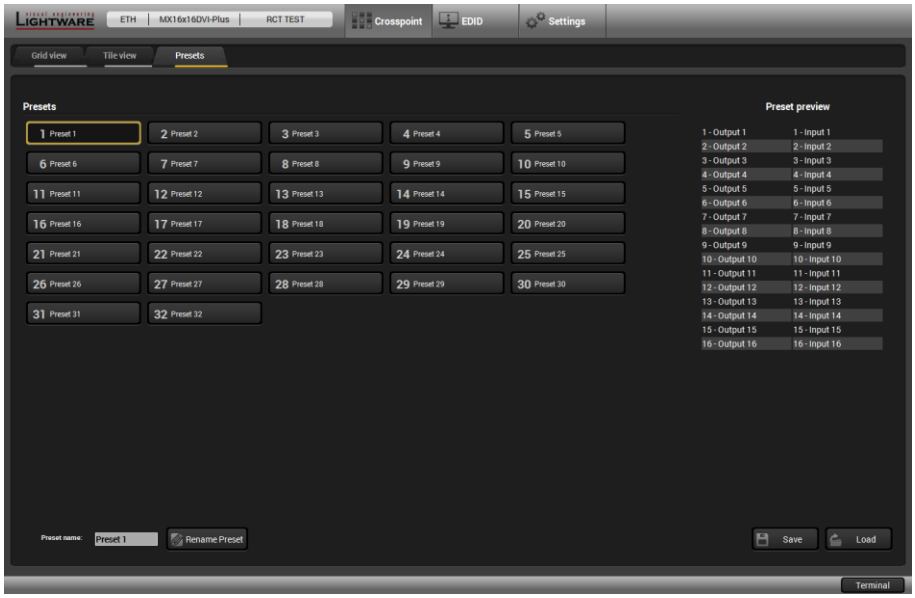


Figure 5-2. Presets tab

A preset can be selected by pressing its button on the left. Preview preset (on the right) will show the crosspoint settings of input and output ports.

Loading a preset

Step 1. Select Preset tab from Crosspoint menu.

Step 2. Select the preset memory (Preset1...Preset32) you want to load as the next crosspoint configuration.

Step 3. Press Load button below Preset preview list. Now the preset is loaded.

Step 4. The new I/O configuration is displayed in Grid view.

Saving a preset

Step 1. Make the desired crosspoint connections in Tile view or Grid view.

Step 2. Select the preset memory (Preset1...Preset32) where you want to save your current crosspoint connections.

Step 3. Press Save button below Preset preview list.

Step 4. A confirmation message is displayed on the information bar; the preset is stored.

Renaming a preset

Step 1. Select the preset memory (Preset1...Preset32) you want to rename.

Step 2. Type the desired name and press Rename Preset button; the new name is stored.

5.8. EDID menu

Advanced EDID Management can be accessed by selecting the EDID menu. There are two panels: left one contains Source EDIDs, right one contains Destination places where the EDIDs can be emulated or copied.

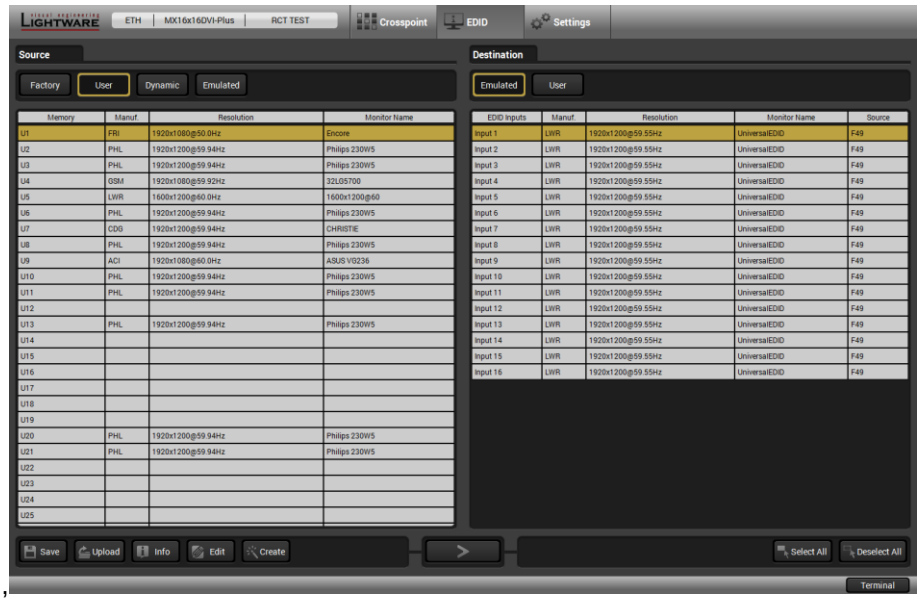


Figure 5-3. EDID menu

Control buttons

Save	Exporting an EDID (save to a file)	>	Executing EDID emulation (Transfer button)
Upload	Importing an EDID (load from a file)	Select All	Selecting all memory places in the right panel
Info	Display EDID Summary window	Unselect All	Selecting none of the memory places in the right panel
Edit	Opening Advanced EDID Editor with the selected EDID	Create	Opening Easy EDID Creator

5.8.1. Sources and Destinations

The EDID memory consists of four parts:

Factory EDID list shows the pre-programmed EDIDs.

User memory shows the memory locations which can be used by the user to save custom EDIDs.

Dynamic EDID List shows the display devices connected to the device's outputs. The unit stores the last display devices' EDID on either output, so there is an EDID shown even if there is no display device attached to the output of the transmitter at the moment.

Emulated EDID list shows the currently emulated EDID for the inputs. The source column displays the memory location that the current EDID was routed from.

There are two types of EDID emulation: static and dynamic.

- **Static EDID emulation** happens, when an EDID from the Factory or User EDID list is selected. In this case the Emulated EDID will remain the same until the user emulates another EDID.
- **Dynamic EDID emulation** can be enabled by selecting D1 or D2 EDID memory. The attached monitor's EDID is copied to the input; if a new monitor is attached to the output, the emulated EDID changes automatically.

5.8.2. Changing emulated EDID

Step 1. Select the desired EDID list from one of the three sources by pressing its button.

Step 2. Select an EDID from the Source panel to emulate.

Step 3. Press Emulated button on the top of the Destination panel.

Step 4. Select desired port on the right panel (more than one ports can also be selected); the EDID(s) will be highlighted with yellow cursor.

Step 5. Press Transfer button to change the emulated EDID.

5.8.3. Exporting an EDID

Source EDID can be downloaded as a file (*.bin, *.dat or *.edid) to the computer.

Step 1. Select the desired EDID from the Source panel (highlighted with yellow cursor).

Step 2. Press the Save button to open the Save as dialog and download the file to the computer.

5.8.4. Importing an EDID

Previously saved EDID (*.bin, *.dat or *.edid file) can be uploaded to the user memory:

Step 1. Press the User button on the top of the Source panel.

Step 2. Select a memory slot from the Source panel.

Step 3. Press the Upload button below the Source panel.

Step 4. Browse the file in the opening window then press the Open button. Browsed EDID is imported into the selected User memory.

Info: The imported EDID overwrites the selected memory place even if it is not empty.

5.8.5. EDID Summary window

Select an EDID from Source panel and press Info button to display the EDID summary.

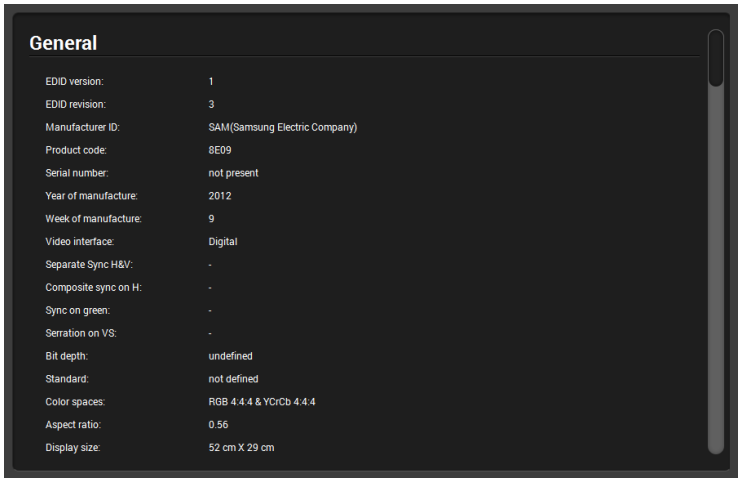


Figure 5-4. EDID Summary

5.8.6. Editing an EDID

Select an EDID from Source panel and press the Edit button to display Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extensions. Any EDID from the device's memory can be loaded in the editor. The software resolves the raw EDID, and displays it as readable information to the user. The modified EDID can be saved to the User memory.

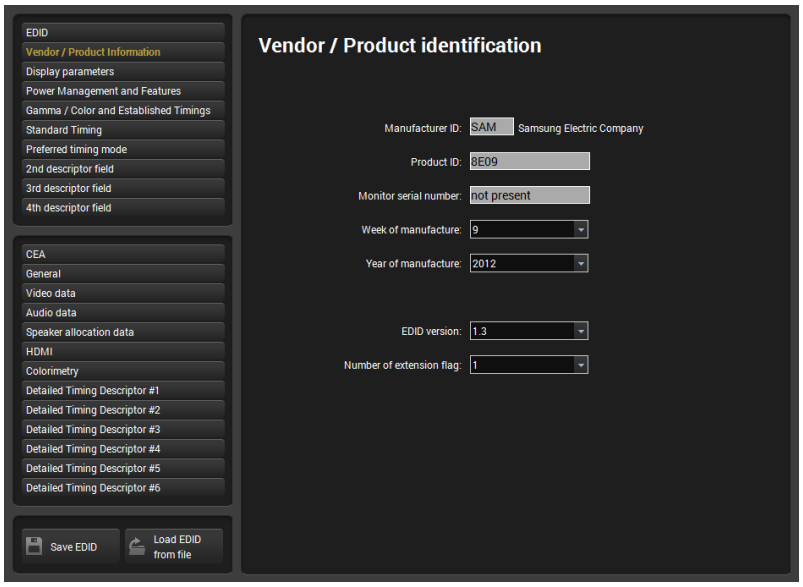


Figure 5-5. Advanced EDID Editor

5.8.7. Creating an EDID

Lightware introduced a wizard-like interface for fast and easy EDID creation. With Easy EDID Creator it is possible to create custom EDIDs in four simple steps. By clicking on the Create button below Source panel, Easy EDID Creator is opened in a new window.

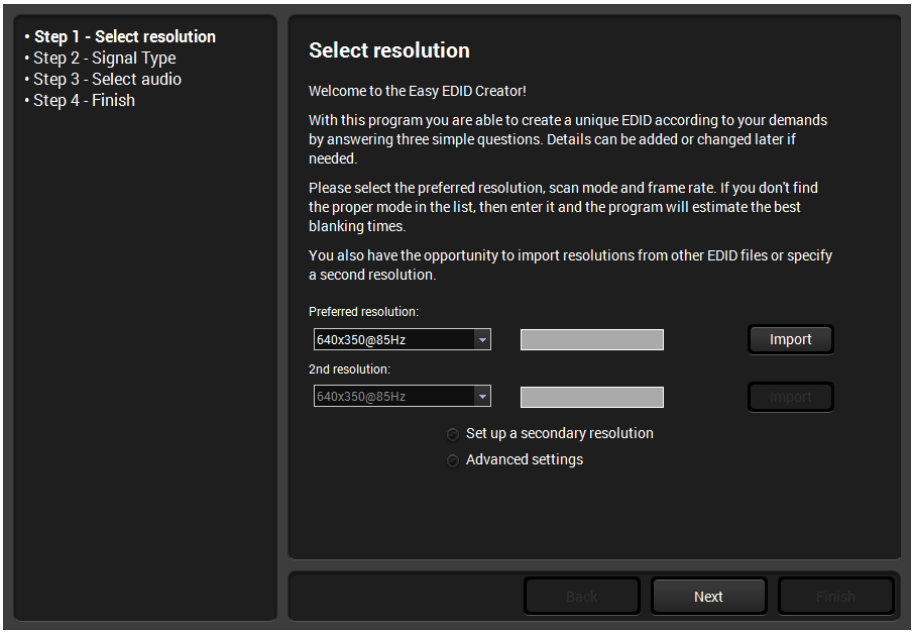

• Step 1 - Select resolution
• Step 2 - Signal Type
• Step 3 - Select audio
• Step 4 - Finish
Select resolution
Welcome to the Easy EDID Creator!
With this program you are able to create a unique EDID according to your demands by answering three simple questions. Details can be added or changed later if needed.
Please select the preferred resolution, scan mode and frame rate. If you don't find the proper mode in the list, then enter it and the program will estimate the best blanking times.
You also have the opportunity to import resolutions from other EDID files or specify a second resolution.
Preferred resolution:
640x350@85Hz
Import
2nd resolution:
640x350@85Hz
Import
Set up a secondary resolution
Advanced settings
Back
Next
Finish

Figure 5-6. Easy EDID creator wizard

Creating an EDID – steps

Step 1. Select resolution

The preferred resolution can be defined here. There are more ways to define the desired format. Select one from the drop-down list where the most common resolutions are listed.

Step 2. Signal type

You have to decide whether you want to add HDMI support to your EDID or not. Please note that the use of audio, non-RGB color spaces and deep color requires the HDMI mode.

Step 3. Select audio

If you have selected HDMI support in the previous step, specify the desired audio format. The most common audio formats are listed, but the number of possible formats is greater. If you don't find your preferred audio, you are able to add it later by using EDID editor.

Step 4. Finish

You have to give a name to your new EDID as last step. This name will be fit into the display product descriptor, so it can be up to 13 alphanumeric characters long. You also have to select the desired operation: you are able to upload the new EDID to the actually used Lightware product or/and save it to a file or/and open it in the EDID editor.

Info: For more information about creating and EDID by using EEC see the User's manual of the EDID Editor which is available at www.lightware.eu.

5.9. Settings menu

5.9.1. Configuration tab

Settings about establishing the connection to the matrix are available on this tab.

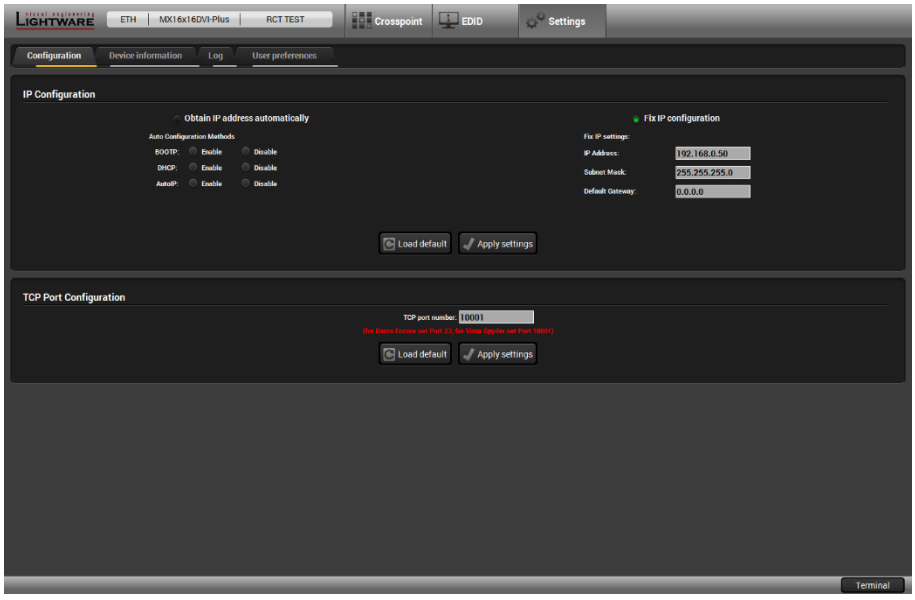


Figure 5-7. Configuration tab

IP Configuration

Obtain IP address automatically

The feature means that the matrix gets the IP address from the DHCP server on the LAN. If DHCP server is not present, the device gets an AutoIP address from 169.254.xxx.xxx domain automatically. Set BOOTP, DHCP and AutoIP settings according to your network requirements. Always press the Apply settings button to save changes.

Info: Load default button restores the default network settings (fix IP) to the device: fix IP Address: 192.168.254.254, Subnet Mask: 255.255.0.0, Default Gateway: 0.0.0.0.

Fix IP configuration

In this case, connected device has an IP address configuration set up by the user/administrator. Depending on modified settings, you might need to restart the device and the Control Software. Always press the Apply settings button to save changes.

Info: Load default button restores the default network settings (fix IP) to the device: fix IP Address: 192.168.254.254, Subnet Mask: 255.255.0.0, Default Gateway: 0.0.0.0.

TCP Port Configuration

Devices can be accessed via this TCP/IP port number with TCP connection. Port number can be modified to any number between 1025 and 65535 except the followings:

9999, 14000 - 14009, 30704, and 30718.

To use a matrix with Barco Encore set port to 23.

To use a matrix with Vista Spyder set port to 10001.

Always press the Apply settings button to save changes.

5.9.2. Device information tab

Basic information are displayed about the device in this menu: Device type with serial number and installed cards' type with firmware and hardware version.

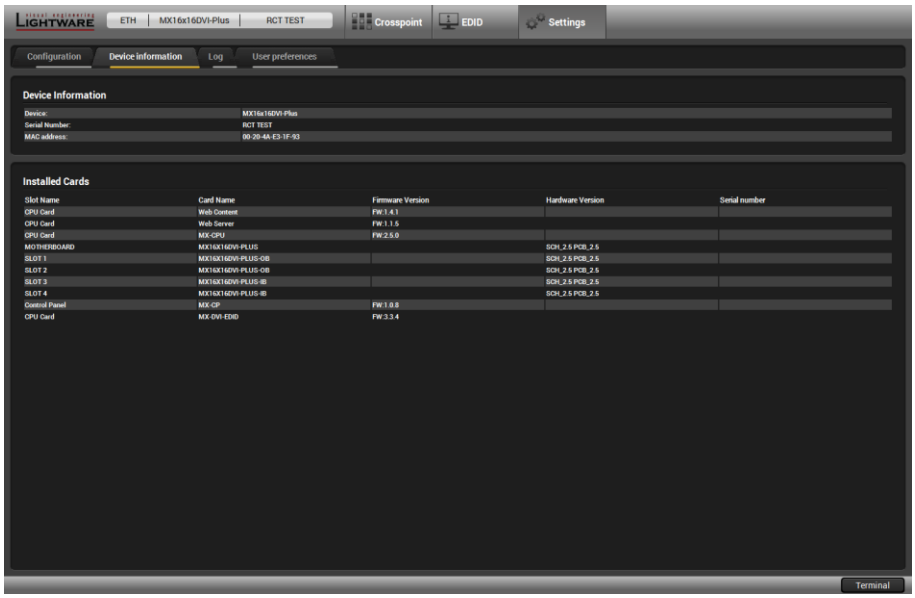


Figure 5-8. Device information tab

5.9.3. Log tab

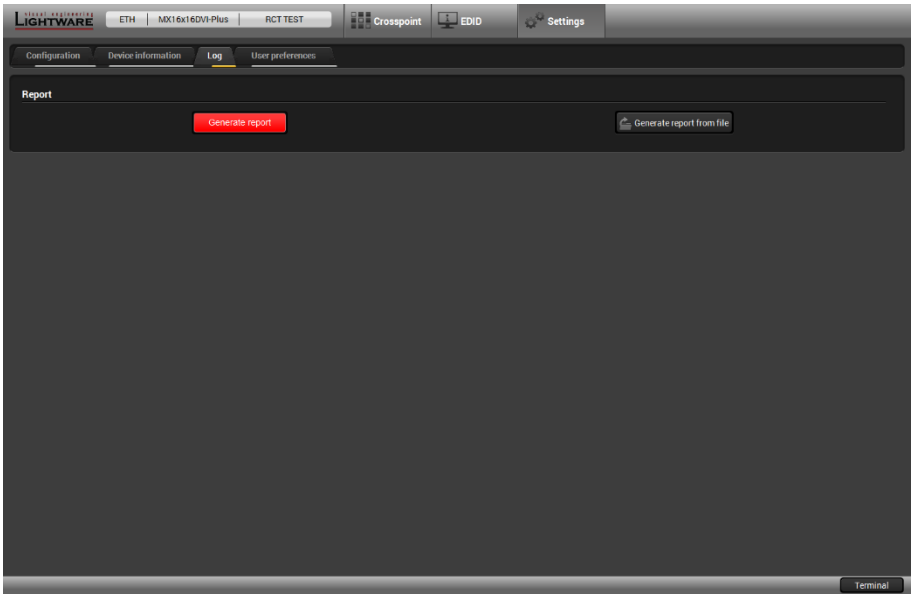


Figure 5-9. Log tab

Generate report

LDC is able to collect information from the device and save it to a report file. This information package can be sent to Lightware when a problem may arise with the device.

Info: When a report is necessary to generate, always let the devices be connected to the device, do not disconnect them. The Controller Software will collect information about the devices and about their status.

Step 1. Press the big red button on the Log tab in the Settings menu: Generate report file.

Step 2. The Save as dialog box appears. Select the place where you want to save the report file. The default file name can be changed.

Step 3. LDC collects the needed information. This may take up to 5 minutes.

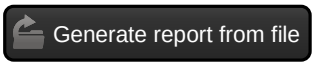
Step 4. When the process is finished, the folder is opened, where the file was saved.

The report contains the following information:

- Current command protocol
- The equipment type and serial number
- Status of input/output ports
- Installed controllers and I/O board types and firmware with versions
- Network settings
- All EDID headers and status (emulated, dynamic, factory, user)

Browse command file

The Controller Software is able to send a custom command file to the device. The command file can be generated by Lightware support. This is needed when some special commands has to be used for configuring or troubleshooting.



Info: This function is only for special troubleshooting cases.

5.10. Terminal

The terminal is created mainly for testing and debugging purposes. The command text can be typed directly. Press Terminal button in the right bottom corner to open the window.

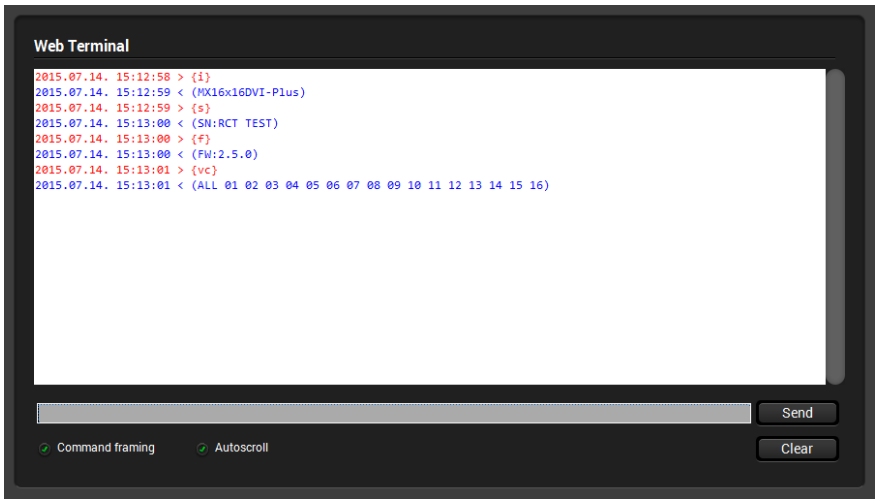


Figure 5-10. Terminal window

Commands are automatically surrounded by framing brackets by default. Every sent command is red-colored and gets a '>' prefix. Received responses are blue-colored and starts with '<'.

The timecode in every row shows the exact time when the command was sent or the response received.

If the Command framing checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

If the Autoscroll checkbox is checked, the window is scrolled down automatically when a new row is added.

The window can be emptied by pressing the Clear button.

5.11. Device discovery (information ribbon)

This label shows the interface type, the name and the serial number of the connected device. The Device discovery window can be started by clicking on this ribbon. Clicking Yes will open the window. See section 5.4 on page 28 how to establish the connection. Clicking No will close the pop up window and current connection remains active.

ETH	MX16x16DVI-Plus	12345678

6. Web control – Using built-in website

Lightware matrices have a built-in web page, which can be accessed over TCP/IP protocol and offers you full control over all settings even if you don't have the opportunity to install new programs. The router's built-in website is compatible with most widely spread browsers and requires no additional software components such as ActiveX controls.

To access the webpage just run your preferred web browser and type the IP address of the router as URL. The computer and the router have to be in the same subnet.

Info: The only way to find out the router's IP address (if it is not known) is to search for devices with the Lightware Device Controller software. If this is not possible for some reason, the IP address can be reset to factory default (192.168.254.254) with the front panel buttons. See section 4.3.5 on page 22 for details.

Info: Only one opened web page is allowed simultaneously. Other TCP/IP connections are prohibited while the web page is opened. Using more instances of the web page simultaneously will result in inadequate operations.

Info: Some of the Lightware Device Controller functions are not available in the built-in website. Please read section 4.3.2 on page 21 to compare the user interfaces.

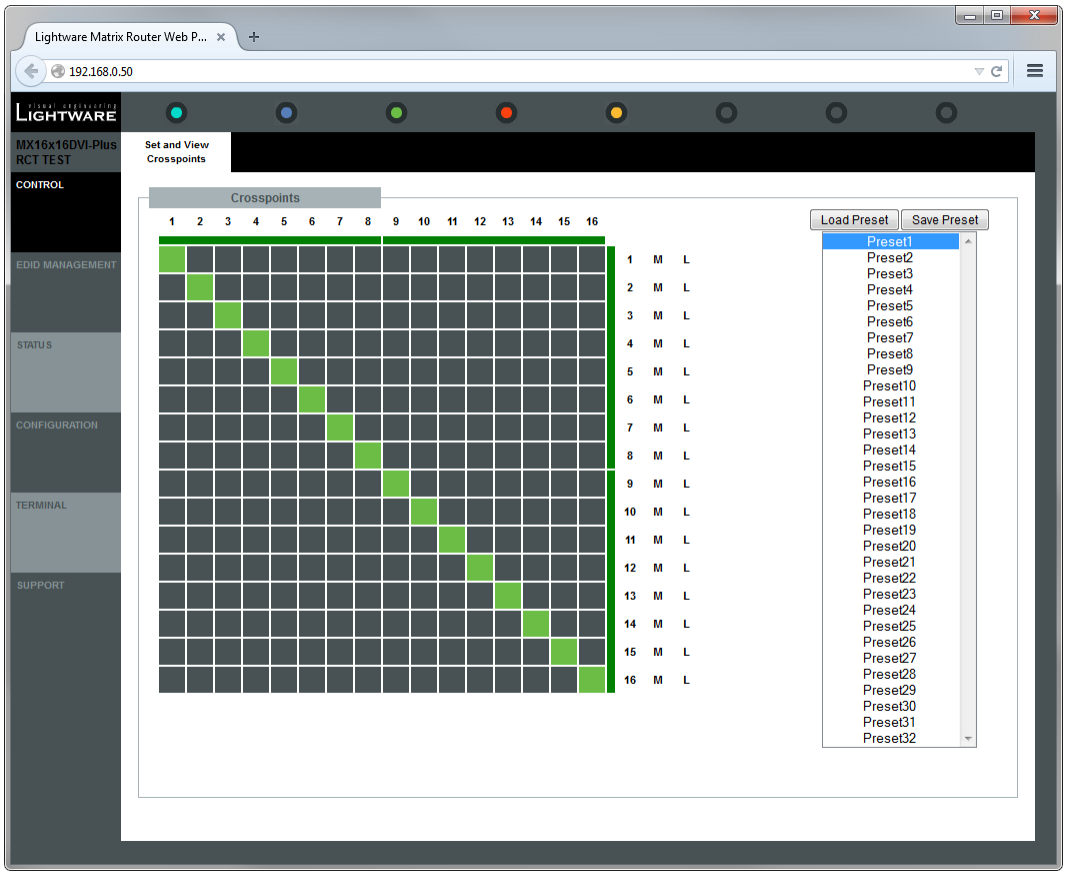


Figure 6-1. Built-in website main page

6.1. Control menu

6.1.1. Crosspoint switching

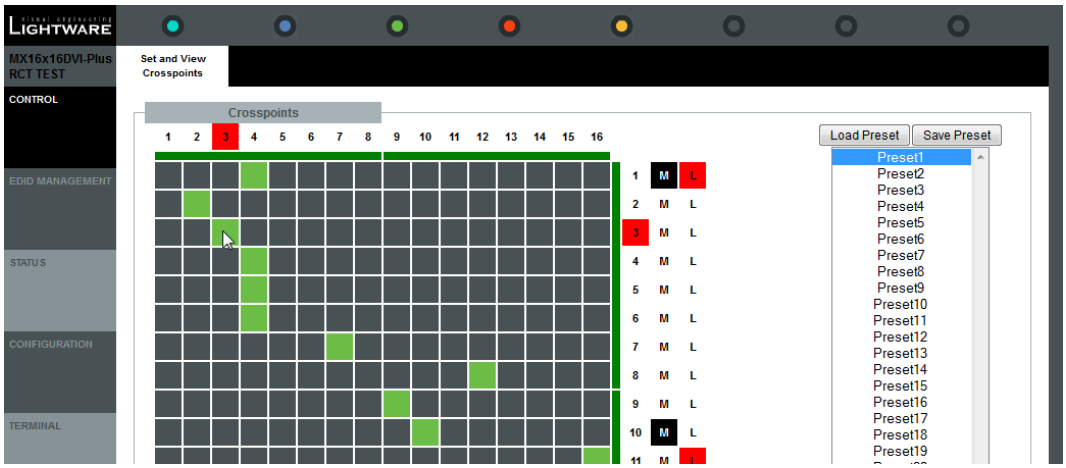


Figure 6-2. Built-in website crosspoint array

This menu contains the crosspoint area and the preset area. After connecting to a new device, this menu appears by default. 1; 2; 3… columns represent the inputs, and the 1; 2; 3… rows represent the outputs. Each green square represents a live connection. Click on the desired grey square to make the connection. When the mouse pointer hovers over the array, the corresponding input and output numbers are highlighted in red to help switching.

6.1.2. Mute outputs

Outputs can be easily muted by clicking the button titled 'M' beside the output. This means that no signal will be present at this output. If muting is active the background turns to black.

6.1.3. Lock outputs

Outputs can be locked to any inputs. After locking an input to an output no switching is permitted for that output unless it is unlocked again. If lock is active, background turns to red.

Info: Loading a preset doesn't change neither the lock state nor the switch state of a locked output. If an output is locked to an input before preset loading, it will also be locked that input after preset loading, so locked outputs ignore the preset.

6.1.4. Preset operations

Preset operations can be done in the right panel of the **Control → Set and View Crosspoints** page. Lightware matrices have 32 preset memories which can be loaded and saved any time.

Info: A preset setting stores a full configuration of all outputs, so preset loading have an effect on every output, except the locked ones.

Save Preset

Step 1. Make the desired configuration on matrix switching area.

Step 2. Select the desired preset memory location.

Step 3. Press the Save Preset button. A message box confirms that the preset is stored.

Load Preset

Step 1. Select the preset memory location (Preset1...Preset32) you want to load as next configuration.

Step 2. Press the Load Preset button. Now the preset is loaded

Step 3. The new I/O configuration is displayed on the matrix switching area.

6.2. EDID menu

By clicking on the **EDID MANAGEMENT** menu, the EDID Router page appears.

When the user enters the menu first, the whole EDID list is being downloaded from the matrix. It may take up to 40 seconds for the first time. After the list is downloaded, the current status of the router's EDID is shown in the three boxes.

The **Emulated EDID** list contains the resolutions and the vendor names of the EDID reported to the source for each input separately.

The **Last attached Monitor's EDID** list contains the resolutions and vendor names of the display devices connected to matrix switcher's output.

The **Factory EDID List** shows the factory memory locations (01# - 50#) with preprogrammed EDID.

The **User EDID List** shows the memory locations (51# - 100#) which can be used by the user to save custom EDIDs.

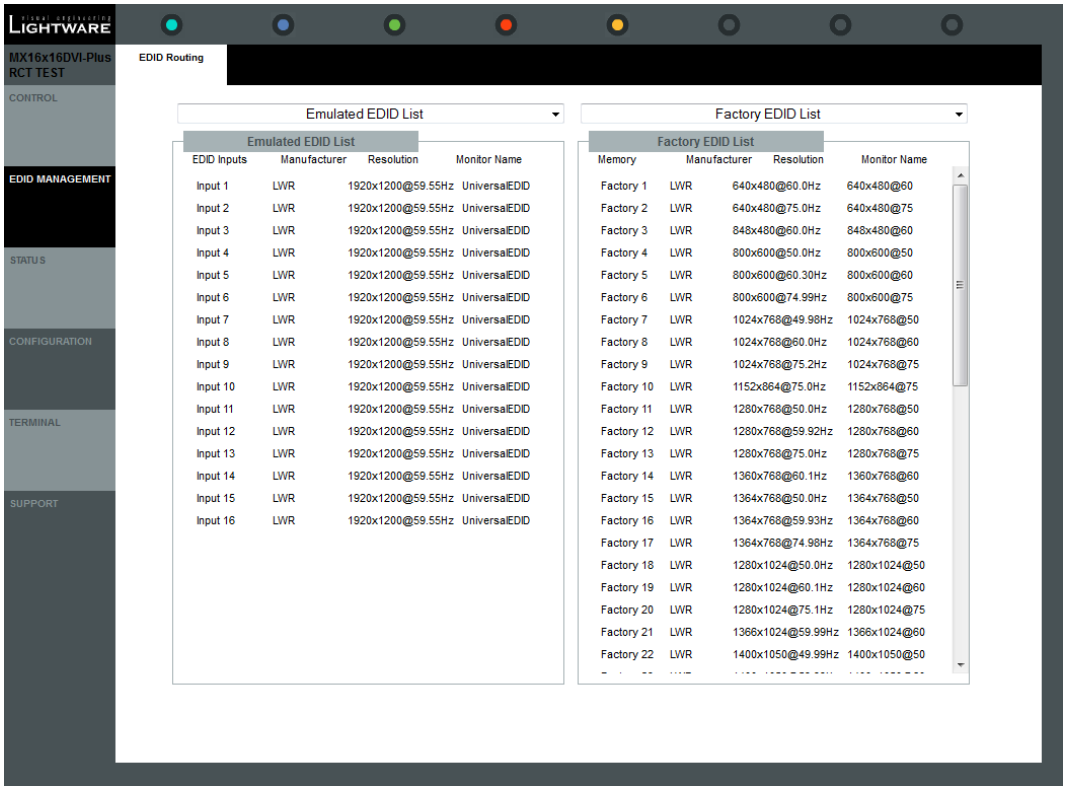

LIGHTWARE
MX16x16DVI-Plus
RCT TEST
CONTROL
EDID MANAGEMENT
STATUS
CONFIGURATION
TERMINAL
SUPPORT
EDID Routing
Emulated EDID List
Factory EDID List
EDID Inputs Manufacturer Resolution Monitor Name
Input 1 LWR 1920x1200@59.55Hz UniversalEDID
Input 2 LWR 1920x1200@59.55Hz UniversalEDID
Input 3 LWR 1920x1200@59.55Hz UniversalEDID
Input 4 LWR 1920x1200@59.55Hz UniversalEDID
Input 5 LWR 1920x1200@59.55Hz UniversalEDID
Input 6 LWR 1920x1200@59.55Hz UniversalEDID
Input 7 LWR 1920x1200@59.55Hz UniversalEDID
Input 8 LWR 1920x1200@59.55Hz UniversalEDID
Input 9 LWR 1920x1200@59.55Hz UniversalEDID
Input 10 LWR 1920x1200@59.55Hz UniversalEDID
Input 11 LWR 1920x1200@59.55Hz UniversalEDID
Input 12 LWR 1920x1200@59.55Hz UniversalEDID
Input 13 LWR 1920x1200@59.55Hz UniversalEDID
Input 14 LWR 1920x1200@59.55Hz UniversalEDID
Input 15 LWR 1920x1200@59.55Hz UniversalEDID
Input 16 LWR 1920x1200@59.55Hz UniversalEDID
Memory Manufacturer Resolution Monitor Name
Factory 1 LWR 640x480@60.0Hz 640x480@60
Factory 2 LWR 640x480@75.0Hz 640x480@75
Factory 3 LWR 848x480@60.0Hz 848x480@60
Factory 4 LWR 800x600@50.0Hz 800x600@50
Factory 5 LWR 800x600@60.30Hz 800x600@60
Factory 6 LWR 800x600@74.99Hz 800x600@75
Factory 7 LWR 1024x768@49.98Hz 1024x768@50
Factory 8 LWR 1024x768@60.0Hz 1024x768@60
Factory 9 LWR 1024x768@75.2Hz 1024x768@75
Factory 10 LWR 1152x864@75.0Hz 1152x864@75
Factory 11 LWR 1280x768@50.0Hz 1280x768@50
Factory 12 LWR 1280x768@59.92Hz 1280x768@60
Factory 13 LWR 1280x768@75.0Hz 1280x768@75
Factory 14 LWR 1360x768@60.1Hz 1360x768@60
Factory 15 LWR 1364x768@50.0Hz 1364x768@50
Factory 16 LWR 1364x768@59.93Hz 1364x768@60
Factory 17 LWR 1364x768@74.98Hz 1364x768@75
Factory 18 LWR 1280x1024@50.0Hz 1280x1024@50
Factory 19 LWR 1280x1024@60.1Hz 1280x1024@60
Factory 20 LWR 1280x1024@75.1Hz 1280x1024@75
Factory 21 LWR 1366x1024@59.99Hz 1366x1024@60
Factory 22 LWR 1400x1050@49.99Hz 1400x1050@50

Figure 6-3. EDID lists

6.2.1. Change emulated EDID at one or all inputs

Step 1. Select the Emulated EDID List in one of the window areas in the drop down list.

Step 2. Select the desired EDID List in another window area in the drop down list.

Step 3. Select the desired EDID from this list with a left mouse click, a popup message appears. (Memory location, manufacturer, Resolution and Monitor name of the selected EDID)

Step 4. Click on the desired memory location in the Emulated EDID List window, or the "Switch to all input" button. Now the EDID has been changed on selected input. If the EDID changing was successful a reply message will be appeared on the bottom of the page.

Step 5. Click on the "Cancel" button to exit EDID changing.

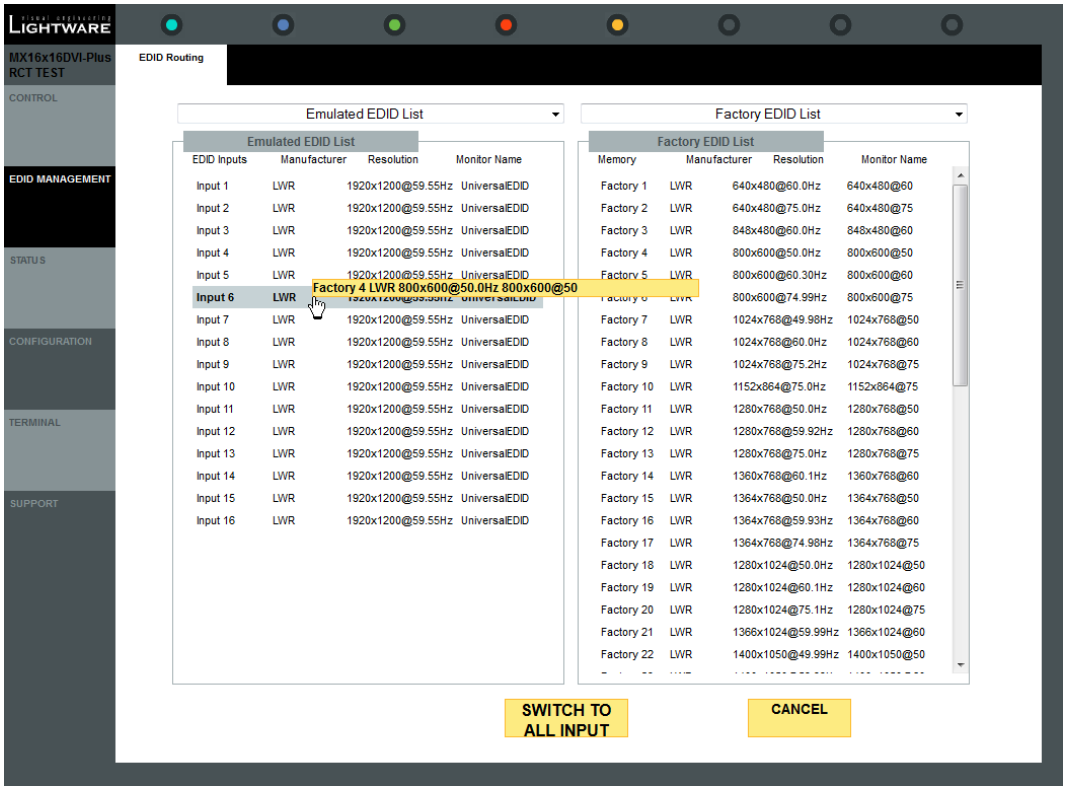

LIGHTWARE
MX16x16DVI-Plus RCT TEST
CONTROL
EDID MANAGEMENT
STATUS
CONFIGURATION
TERMINAL
SUPPORT
EDID Routing
Emulated EDID List
Factory EDID List
Emulated EDID List
EDID Inputs Manufacturer Resolution Monitor Name
Input 1 LWR 1920x1200@59.55Hz UniversalEDID
Input 2 LWR 1920x1200@59.55Hz UniversalEDID
Input 3 LWR 1920x1200@59.55Hz UniversalEDID
Input 4 LWR 1920x1200@59.55Hz UniversalEDID
Input 5 LWR 1920x1200@59.55Hz UniversalEDID
Input 6 LWR
Input 7 LWR 1920x1200@59.55Hz UniversalEDID
Input 8 LWR 1920x1200@59.55Hz UniversalEDID
Input 9 LWR 1920x1200@59.55Hz UniversalEDID
Input 10 LWR 1920x1200@59.55Hz UniversalEDID
Input 11 LWR 1920x1200@59.55Hz UniversalEDID
Input 12 LWR 1920x1200@59.55Hz UniversalEDID
Input 13 LWR 1920x1200@59.55Hz UniversalEDID
Input 14 LWR 1920x1200@59.55Hz UniversalEDID
Input 15 LWR 1920x1200@59.55Hz UniversalEDID
Input 16 LWR 1920x1200@59.55Hz UniversalEDID
Factory 4 LWR 800x600@50.0Hz 800x600@50
Factory EDID List
Memory Manufacturer Resolution Monitor Name
Factory 1 LWR 640x480@60.0Hz 640x480@60
Factory 2 LWR 640x480@75.0Hz 640x480@75
Factory 3 LWR 848x480@60.0Hz 848x480@60
Factory 4 LWR 800x600@50.0Hz 800x600@50
Factory 5 LWR 800x600@60.30Hz 800x600@60
800x600@74.99Hz 800x600@75
Factory 7 LWR 1024x768@49.98Hz 1024x768@50
Factory 8 LWR 1024x768@60.0Hz 1024x768@60
Factory 9 LWR 1024x768@75.2Hz 1024x768@75
Factory 10 LWR 1152x864@75.0Hz 1152x864@75
Factory 11 LWR 1280x768@50.0Hz 1280x768@50
Factory 12 LWR 1280x768@59.92Hz 1280x768@60
Factory 13 LWR 1280x768@75.0Hz 1280x768@75
Factory 14 LWR 1360x768@60.1Hz 1360x768@60
Factory 15 LWR 1364x768@50.0Hz 1364x768@50
Factory 16 LWR 1364x768@59.93Hz 1364x768@60
Factory 17 LWR 1364x768@74.98Hz 1364x768@75
Factory 18 LWR 1280x1024@50.0Hz 1280x1024@50
Factory 19 LWR 1280x1024@60.1Hz 1280x1024@60
Factory 20 LWR 1280x1024@75.1Hz 1280x1024@75
Factory 21 LWR 1366x1024@59.99Hz 1366x1024@60
Factory 22 LWR 1400x1050@49.99Hz 1400x1050@50
SWITCH TO ALL INPUT
CANCEL

Figure 6-4. Static EDID routing

Info: Switching an EDID to ALL inputs may take several seconds.

The user can switch and learn EDIDs also in the **Last Attached Monitors EDIDs** window. Switching an EDID from this list to an input results dynamic EDID routing. This means that the emulated EDID changes automatically, if a new monitor is attached to the output, by simply copying the data from the monitor.

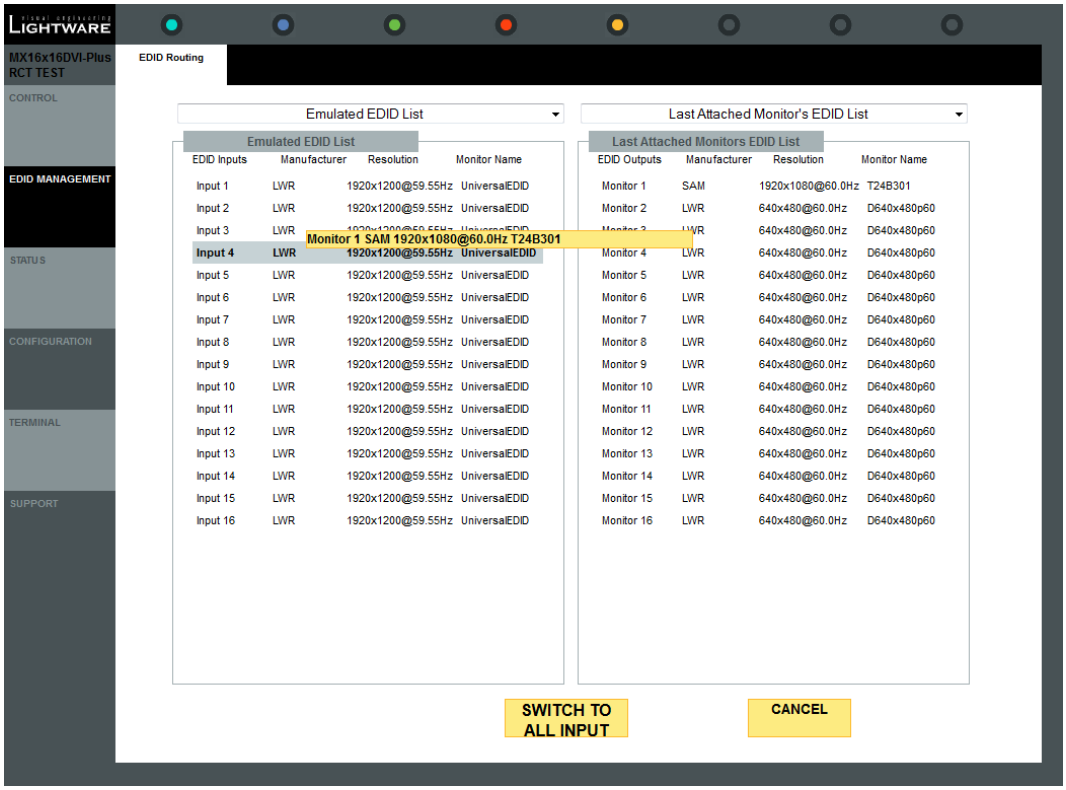

LIGHTWARE
MX16x16DVI-Plus RCT TEST
CONTROL
EDID MANAGEMENT
STATUS
CONFIGURATION
TERMINAL
SUPPORT
EDID Routing
Emulated EDID List
Last Attached Monitor's EDID List
Emulated EDID List
EDID Inputs Manufacturer Resolution Monitor Name
Input 1 LWR 1920x1200@59.55Hz UniversalEDID
Input 2 LWR 1920x1200@59.55Hz UniversalEDID
Input 3 LWR
Input 4 LWR 1920x1200@59.55Hz UniversalEDID
Input 5 LWR 1920x1200@59.55Hz UniversalEDID
Input 6 LWR 1920x1200@59.55Hz UniversalEDID
Input 7 LWR 1920x1200@59.55Hz UniversalEDID
Input 8 LWR 1920x1200@59.55Hz UniversalEDID
Input 9 LWR 1920x1200@59.55Hz UniversalEDID
Input 10 LWR 1920x1200@59.55Hz UniversalEDID
Input 11 LWR 1920x1200@59.55Hz UniversalEDID
Input 12 LWR 1920x1200@59.55Hz UniversalEDID
Input 13 LWR 1920x1200@59.55Hz UniversalEDID
Input 14 LWR 1920x1200@59.55Hz UniversalEDID
Input 15 LWR 1920x1200@59.55Hz UniversalEDID
Input 16 LWR 1920x1200@59.55Hz UniversalEDID
Monitor 1 SAM 1920x1080@60.0Hz T24B301
Last Attached Monitors EDID List
EDID Outputs Manufacturer Resolution Monitor Name
Monitor 1 SAM 1920x1080@60.0Hz T24B301
Monitor 2 LWR 640x480@60.0Hz D640x480p60
Monitor 3 LWR 640x480@60.0Hz D640x480p60
Monitor 4 LWR 640x480@60.0Hz D640x480p60
Monitor 5 LWR 640x480@60.0Hz D640x480p60
Monitor 6 LWR 640x480@60.0Hz D640x480p60
Monitor 7 LWR 640x480@60.0Hz D640x480p60
Monitor 8 LWR 640x480@60.0Hz D640x480p60
Monitor 9 LWR 640x480@60.0Hz D640x480p60
Monitor 10 LWR 640x480@60.0Hz D640x480p60
Monitor 11 LWR 640x480@60.0Hz D640x480p60
Monitor 12 LWR 640x480@60.0Hz D640x480p60
Monitor 13 LWR 640x480@60.0Hz D640x480p60
Monitor 14 LWR 640x480@60.0Hz D640x480p60
Monitor 15 LWR 640x480@60.0Hz D640x480p60
Monitor 16 LWR 640x480@60.0Hz D640x480p60
SWITCH TO ALL INPUT
CANCEL

Figure 6-5. Dynamic EDID routing

6.3. Status menu

Basic device information, such as the installed cards' firmware and hardware revisions are displayed in this window.

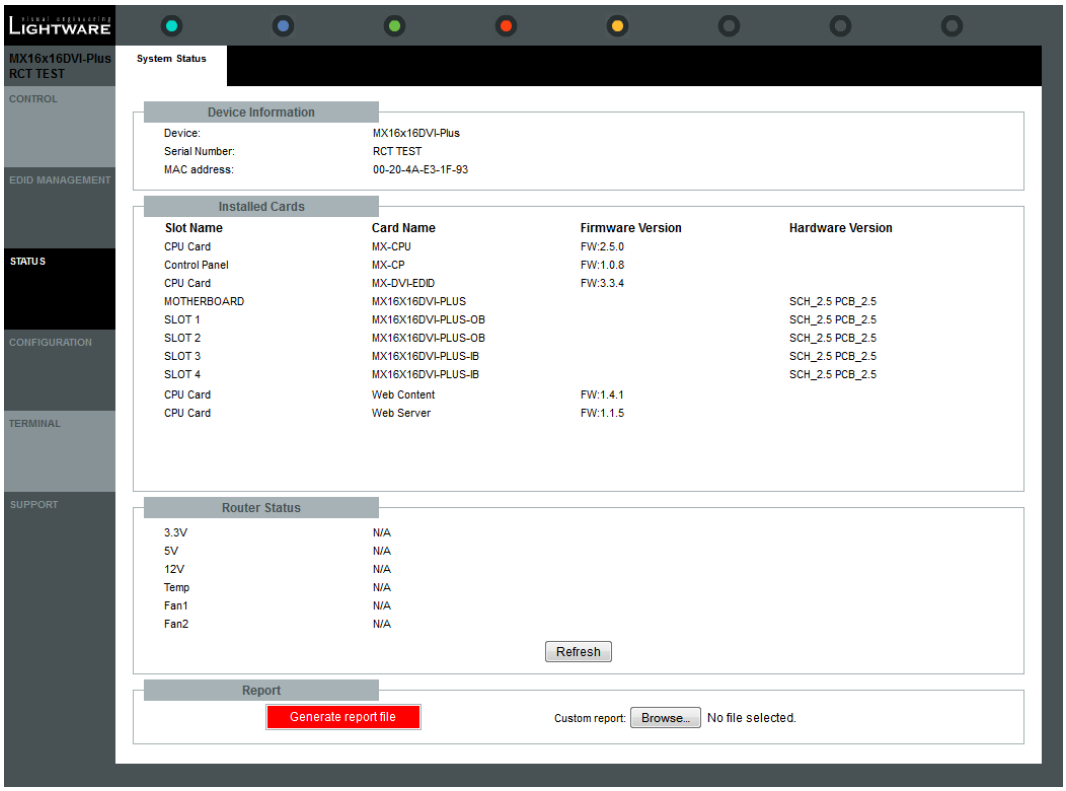


Figure 6-6. Status menu

6.3.1. Generate report file

The built-in website allows user to generate a standard report file which contains basic information about the health and the version numbers of the matrix:

- Current command protocol
- The equipment type and serial number
- Status of input/output ports
- Installed controllers and I/O board types and firmware with versions
- Network settings
- All EDID headers and status (emulated, dynamic, factory, user)

Info: User's issues can be solved easier by Lightware technical support if the generated report file was sent.

Standard Report generating

Step 1. Click on the "Generate report file button"; the process is started.

Step 2. During the process a red "Generating report…" message will appear.

Important: Let the device finish the process! Do not exit or select another menu item.

Step 3. After finishing a red "The report is now ready. Click HERE to download it." message will appear. Click on this message to download the report file to the computer.

Step 4. Choose the desired location and click on the save button. The default file name is: *Lightware_matrix_standard_report_devicename_serialnumber_date_time_.txt*

6.3.2. Generate custom report

The built-in website can run a special command file. After running, a new report file is generated which is useful for Lightware Support Team when debugging.

If a command file was sent:

Step 1. Save it to the computer.

Step 2. Click on the 'Browse…' button or on the 'No file selected' text. A 'File upload' window will open.

Step 3. Choose the command file. Generating will start automatically.

Step 4. During the process a red "Generating report…" message will appear.

Important: Let the Device finish the process! Do not exit or select another menu item.

Step 5. When the generating is done, a red message will appear.

Click on this message to download the report file to the computer. A browser window will open.

Step 6. Choose the location of the report file and click on the save button.
The default file name is:
Lightware_matrix_standard_report_devicename_serialnumber_date_time_.txt.

6.4. Configuration menu

The network settings of the matrix are displayed under Configuration menu.

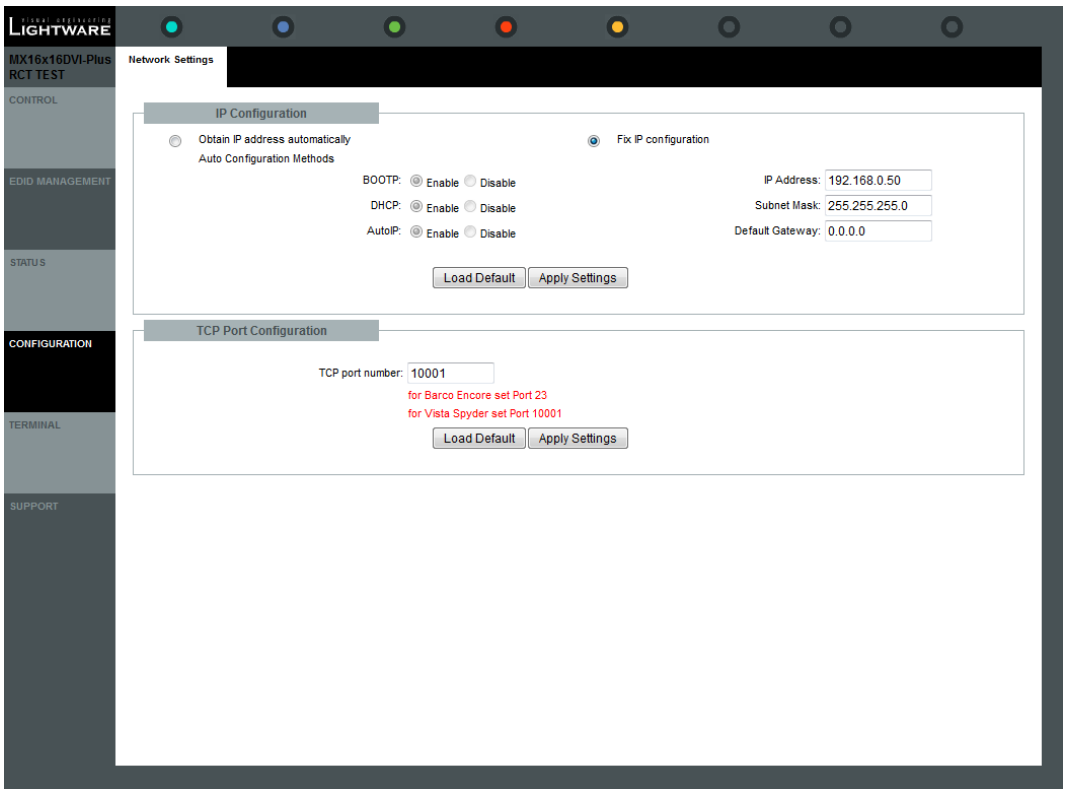


Figure 6-7. Configuration menu

Info: Factory default IP settings can be reloaded by the front panel buttons. See section 4.3.5 on page 22.

6.4.1. Automatic IP Address Configuration

The matrix switcher supports three of the most used automatic IP configuration protocols.

To assign IP address automatically

Step 1. Click on Configuration menu.

Step 2. Select Obtain IP address automatically.

Step 3. Enter the following (as necessary):

- **BOOTP:** Select **Enable** to permit the Bootstrap Protocol (BOOTP) server to assign the IP address from a pool of addresses automatically.
- **DHCP:** Select **Enable** to permit the Dynamic Host Configuration Protocol (DHCP) server to assign leased IP address to the matrix unit automatically.
- **AutoIP:** Select Enable to permit the matrix to generate an IP in the 169.254.x.x address range with Class B subnet.

Info: Disabling BOOTP, DHCP, and AutoIP (all three checkboxes) is not advised as the only available IP assignment method will then be ARP or serial port.

Step 4. When you are finished, click Apply Settings button.

Info: To continue using the built-in website, you have to type in the IP address in your browser.

6.4.2. Static IP address configuration

The user can manually assign an IP address to the unit, and enter related network settings.

To assign an IP address manually

Step 1. Click on Configuration menu.

Step 2. Select Fix IP Configuration.

Step 3. Enter the following (as necessary):

- **IP Address:** If DHCP is not used to assign IP addresses, enter it manually in decimal-dot notation. The IP addresses must be set to a unique value in the network.
- **Subnet Mask:** A subnet mask defines the number of bits taken from the IP address that are assigned for the host part.
- **Default Gateway:** The gateway address, or router, allows communication to another LAN segments. The gateway address should be the IP address of the router connected to the same LAN segment as the matrix. The gateway address must be within the local network.

Step 4. When you are finished, click Apply Settings button.

Info: To continue using the built-in website, you must type in the IP address in your browser.

6.4.3. Loading the default IP settings

Step 1. Click on the Load Default button. Now the factory default IP address, Subnet Mask and Gateway address is loaded into the input boxes. But they are not saved.

Step 2. To save the settings, click on Apply Settings button.

Step 3. The default fix IP settings are applied:

IP Address:	192.168.254.254
Subnet Mask:	255.255.0.0
Default Gateway:	0.0.0.0

6.4.4. TCP Port Configuration

The user can configure the TCP port number, which is used to communicate with the matrix router through LAN. The input box initially contains the current setting.

Step 1. Type the desired TCP port number into the input box

Step 2. Press the Apply Settings button. The new port will be active after the next connection.

6.4.5. Loading the default TCP Port settings

Step 1. Click on Load Default button. Now the factory default value is in the input box, but it is not saved.

Step 2. To save, click on Apply Settings button. The new port will be active after the next connection.

6.5. Terminal

This general-purpose web terminal is intended mainly for test and debugs purposes. After a successful connection is established with a router this terminal can be used. All commands can be used here which can be found in chapter 8 on page 52. The text can be typed directly into the textbox.

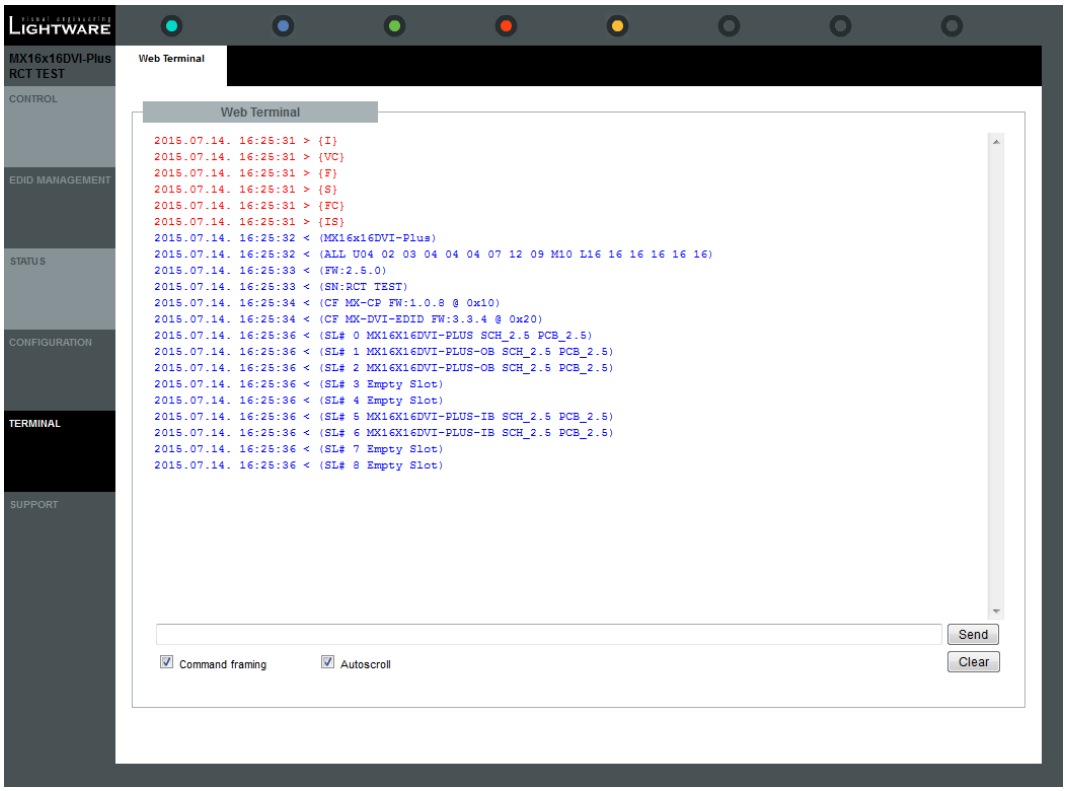


Figure 6-8. Web terminal window

Commands are automatically surrounded by framing brackets (default setting). Every sent command and every received response gets an arrow (-> or <-) prefix, and has different font colors in order to help distinguishing.

If the “Command framing” checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

If the Autoscroll checkbox is unchecked user should use the scroll bar to see the last commands.

6.6. Support

For technical support, please don’t hesitate to contact Lightware Visual Engineering at support@lightware.eu

7. About EDID memory

EDID router contains a 164 block non-volatile memory bank. EDID memory is structured as follows:

1..50 .....Factory Preset EDID list

51..100 ..... User programmable memories

101..116 (DVI_OUT_1...16)* .....Last attached monitor's EDID list

133..148 (DVI_IN_1...16)* .....Emulated EDID at input connectors

* Number of the inputs and outputs depends on the matrix size. (16, 12 or 9)

All EDID (including factory preset; user programmable memories; EDID at other inputs; and EDID at outputs) can be switched and emulated at any of the inputs.

Most of the factory preset EDIDs include only one resolution. This is to force the connected source to give a signal with the needed resolution. However there is a Universal EDID as well which allows many resolutions. Universal EDID (address 49) allows multiple resolutions including all common VESA defined resolutions. In addition, it also features audio support. The use of universal EDID is recommended for fast and easy system setup. Standalone MX DVI-Plus matrices can handle both 128 Byte EDID and 256 Byte extended EDID structures.

Info: The first 50 EDID (1…50 inclusive) are factory preprogrammed and cannot be modified. These are the most commonly used resolutions. The 30..45 memories and 49 (universal EDID) contain EDIDs supporting various embedded audio formats, for HDMI audio. Memory locations 117..132 and 148..164 are reserved for 32x32 matrix configurations only, therefore not accessible in these matrix routers.

Info: The attached monitor's EDID is stored automatically, until a new monitor is attached to that particular output. In case of powering the unit off, the last attached monitor's EDID remains in non-volatile memory even is the monitor is unconnected.

MEMORY	Resolution		MEMORY	Resolution
01	640 x 480 @ 60.0 Hz		**26**	1600 x 1200 @ 50.0 Hz
02	640 x 480 @ 75.0 Hz		**27**	1600 x 1200 @ 60.0 Hz
03	848 x 480 @ 60.0 Hz		**28**	1920 x 1200 @ 59.55 Hz
04	800 x 600 @ 50.0 Hz		**29**	1920 x 1200 @ 50.0 Hz
05	800 x 600 @ 60.30 Hz		**30**	1440 x 480i @ 60.3 Hz
06	800 x 600 @ 74.99 Hz		**31**	640 x 480 @ 59.94 Hz
07	1024 x 768 @ 49.98 Hz		**32**	720 x 480 @ 59.92 Hz
08	1024 x 768 @ 60.0 Hz		**33**	1440 x 576i @ 50.6 Hz
09	1024 x 768 @ 75.2 Hz		**34**	720 x 576 @ 50.0 Hz
10	1152 x 864 @ 75.0 Hz		**35**	1280 x 720 @ 50.0 Hz
11	1280 x 768 @ 50.0 Hz		**36**	1280 x 720 @ 60.0 Hz
12	1280 x 768 @ 59.92 Hz		**37**	1920 x1080i @ 50.3 Hz
13	1280 x 768 @ 75.0 Hz		**38**	1920 x1080i @ 50.0 Hz
14	1360 x 768 @ 60.1 Hz		**39**	1920 x1080i @ 60.5 Hz
15	1364 x 768 @ 50.0 Hz		**40**	1920 x 1080 @ 24.0 Hz
16	1364 x 768 @ 59.93 Hz		**41**	1920 x 1080 @ 24.99 Hz
17	1364 x 768 @ 74.98 Hz		**42**	1920 x 1080 @ 30.0 Hz
18	1280 x 1024 @ 50.0 Hz		**43**	1920 x 1080 @ 50.0 Hz
19	1280 x 1024 @ 60.1 Hz		**44**	1920 x 1080 @ 49.99 Hz
20	1280 x 1024 @ 75.1 Hz		**45**	1920 x 1080 @ 60.0 Hz
21	1366 x 1024 @ 59.99 Hz		**46**	2048 x 1080 @ 49.99 Hz
22	1400 x 1050 @ 49.99 Hz		**47**	2048 x 1080 @ 50.0 Hz
23	1400 x 1050 @ 59.99 Hz		**48**	2048 x 1080 @ 59.99 Hz
24	1400 x 1050 @ 75.0 Hz		**49**	Universal EDID
25	1680 x 1050 @ 59.99 Hz		**50**	2560 x 1600 @ 59.85 Hz

Table 7-1. Factory preset EDID list

8. Programmers reference

Users can connect to the matrix through Ethernet or serial port. After establishing connection, there is no difference between connection types (except some rare cases, which are uniquely noted).

Lightware matrix routers can be controlled with external devices which can communicate according to the router protocol. Lightware routers have a special protocol, but to interoperate with third party devices, a secondary protocol is also provided.

Please see section 4.3 on page 21 about remote operation and connection setup.

8.1. Changing protocols

The router is equipped with multiple router protocols.

The currently used protocol can be viewed or changed any time on the matrix front panel (see 4.3.6 on page 23) or with protocol commands (see 8.6.7 and 8.6.8 on page 63).

8.2. Protocol description

The protocol description hereinafter stands for Lightware protocol.

The matrices accept commands surrounded by curly brackets - { } - and responds data surrounded by round brackets - ( ) - only if a command was successfully executed. All input commands are converted to uppercase, but respond commands can contain upper and lower case letters as well.

Legend for control commands:

<in>	=	input number in 1 or 2 digit ASCII format (01,5,07,16 etc.)
<out>	=	output number in 1 or 2 digit ASCII format
<in²>	=	input number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<out²>	=	output number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<loc>	=	location number in 1, 2 or 3 digit ASCII format
<id>	=	id number in 1 or 2 digit ASCII format
<id²>	=	id number in 2 digit ASCII format
<*italic*>	=	italic parameters are optional
CrLf	=	Carriage return, Line feed (0x0D, 0x0A)
●	=	space character (0x20)
→	=	each command issued by the controller
←	=	each response received from the router

8.3. Batch commands

Usually the commands are sent one by one to the router, but this is not a must. Any command can be send to the router in a batch. To do this, just use the same commands (including { } brackets), but put the "*CrLf*" only at the end of the batch.

In most cases, batch commands are processed just as if they were sent one by one, but for switching commands, the router groups them, and executes switching in one step. The grouping is done only if the switching commands are received after each other, without any interruption (e.g. other command sent between switch commands). In this case, the response format changes, as not only one output's state changed. The response will be in the format as if {VC} were sent.

The below example shows a batch command that resulted group switching:

One by one commands	**Batch commands** (MX16x16DVI-Plus)
→ {02@01}CrLf ← (O01 I02)CrLf	→ {02@01}{04@03}CrLf ← (ALL 02 01 04 01 05 05 05 05 05 05 05 05 05 05 05 05)CrLf
→ {04@03}CrLf ← (O03 I04)CrLf	

The below example shows a batch command that does not resulted group switching, because another command get between:

One by one commands	Batch commands
→ {02@01}CrLf ← (O01 I02)CrLf	→ {02@01}{+04}{04@03}CrLf ← (O01 I02)CrLf
→ {+04}CrLf ← (0MT04)CrLf	← (0MT04)CrLf
→ {04@03}CrLf ← (O03 I04)CrLf	← (O03 I04)CrLf

8.4. Switching and control commands

8.4.1. Switch one input to one output

Description: Switch input <in> to output <out>.

Format	Example
Command {<in>@<out>}	→ {1@5}
Response (O<out²>●I<in²>)CrLf	← (O05 I01)CrLf

Explanation: Input 1 is switched to output 5.

8.4.2. Switch one input to all outputs

Description: Switch input <in> to all outputs.

Format	Example
Command {<in>@O}	→ {02@o}
Response (I<in²>●ALL)CrLf	← (I01 ALL)CrLf

Explanation: Input 2 is switched to all outputs.

8.4.3. View connection on the specified output

Info: Obsolete! Use {VC} instead.

Description: View connection on output <out>.

Format	Example
Command {?<out>}	→ {?05}
Response (O<out²>●I<in²>)CrLf	← (O05 I01)CrLf

Explanation: Viewing connection for output 5. The connected input is 1.

Info: If the output is locked and/or muted, the response contains an extra letter: 'M' when muted, 'L' when locked, and 'U' when muted and locked (e.g. O05 IL01).

8.4.4. View connection on all outputs

Description: Viewing all outputs' connection results in different response length, because it depends on the router's type (length = 16 for MX16x16DVI-Plus, length = 12 for MX12x12DVI-Plus and length = 9 for MX9x9DVI-Plus). The response below supposes a router having 16 outputs.

Format		**Example 1** (MX16x16DVI-Plus)
Command	{VC}	→ {vc}
Response	(ALL●<O1>●<O2>●<O3> ●<O4>●<O5>●<O6>●<O7> ●<O8>●<O9>●<O10> ●<O11>●<O12>●<O13> ●<O14>●<O15>●<O16>)CrLf	← (ALL 02 02 02 05 05 05 08 08 08 08 08 08 08 08 08 08)CrLf

Legend 1: All <Ox> indexes show the corresponding output's connection state. If value <O5> equals 04 it means that output 5 is connected to input 4. <O1>..<O8> are two digit ASCII characters (01, 02, 04, etc.).

Explanation 1: Viewing connection for all outputs. Input 2 is connected to outputs 1, 2 and 3. Input 5 is connected to outputs 4, 5 and 6. Input 8 is connected to outputs 7 through 16.

Info: If an output is locked, muted, or both locked and muted, the response format changes. If outputs are muted you get a letter 'M', if locked a letter 'L' and if muted and locked at the same time 'U' before the 2 digit numbers.

Format		**Example 2** (MX16x16DVI-Plus)
Command	{VC}	→ {vc}
Response	(ALL●<O1>●<O2>●<O3> ●<O4>●<O5>●<O6>●<O7> ●<O8>●<O9>●<O10> ●<O11>●<O121>●<O13> ●<O14>●<O15>●<O16>)CrLf	← (ALL M02 L02 U02 05 05 05 08 08 08 08 08 08 08 08 08 08)CrLf

Legend 2: Any <Ox> indexes can be a two digit number, or there can be a leading character showing the mute and/or lock state for the corresponding output.

Index	**Legend**	**Explanation**
<Ox>	<in²>	<Ox> is connected to <in²>, <Ox> neither muted nor locked.
<Ox>	M<in²>	<Ox> is connected to <in²>, <Ox> is muted, and unlocked.
<Ox>	L<in²>	<Ox> is connected to <in²>, <Ox> is not muted, but locked.
<Ox>	U<in²>	<Ox> is connected to <in²>, <Ox> is muted and locked.

Explanation 2: Viewing connection for all outputs. Input 2 is connected to outputs 1, 2 and 3. Output 1 is muted. Output 2 is locked. Output 3 is muted and locked. Input 5 is connected to outputs 4, 5 and 6. Input 8 is connected to outputs 7 through 16.

8.4.5. View mutes on all outputs

Description: Viewing all outputs' connection results in different response length, because it depends on the router's type (length = 16 for MX16x16DVI-Slim, length = 12 for MX12x12DVI-Slim and length = 9 for MX9x9DVI-Plus). The response below supposes a router having 16 outputs.

Format		**Example** (MX16x16DVI-Plus)
Command	{VM}	→ {vm}
Response	(MUT●<M1>●<M2>●<M3>●<M4>●<M5>●<M6>●<M7>●<M8>●<M9>●<M10>●<M11>●<M12>●<M13>●<M14>●<M15>●<M16>)CrLf	← (MUT 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0)CrLf

Legend: All <Mx> indexes are one digit numbers, showing the mute state for the corresponding output. If <Mx> equals 0 the output x is unmated. If <Mx> equals 1, the output x is muted.

Explanation: Output 1, 3 and 4 are muted, the other outputs are not muted.

8.4.6. Mute specified output

Description: Mute output <out>.

Format	**Example**
Command {#<out>}	→ {#03}
Response (1MT<out²>)CrLf	← (1MT03)CrLf

Explanation: Output 3 is muted. Now no signal presents on output 3.

8.4.7. Unmute specified output

Description: Unmute output <out>.

Format	**Example**
Command {+<out>}	→ {+03}
Response (0MT<out²>)CrLf	← (0MT03)CrLf

Explanation: Output 3 is unmuted. Now output 3 is switched to the input it was connected to prior to the mute command.

8.4.8. Lock specified output

Description: Lock output <out>. Output's state cannot be changed until unlocking.

Format	**Example**
Command {#><out>}	→ {#>05}
Response (1LO<out²>)CrLf	← (1LO05)CrLf

Explanation: Output 5 is locked.

8.4.9. Unlock specified output

Description: Unlock output <out>. Now output 3 state can be changed.

Format	Example
Command {+<<out>}	→ {+<05}
Response (0LO<out²>)CrLf	← (0LO05)CrLf

Explanation: Output 5 is unlocked.

Info: The router issues the above response regardless of the previous state of the output (either it was locked or unlocked).

8.4.10. Save preset to the specified memory location

Description: Save current crosspoint configuration (output states) to preset <id>.

Format	Example
Command {$<id>}	→ {$4}
Response (SPR<id²>)CrLf	← (SPR04)CrLf

Explanation: Current crosspoint state is saved to preset 4, including the mute state of the outputs.

Info: Lock states are not saved. Lock state is assigned to the physical output of the router. Presets don't affect output locks.

8.4.11. Load preset from the specified location

Description: Load preset <id>.

Format	Example
Command {%<id>}	→ {%4}
Response (LPR<id²>)CrLf	← (LPR04)CrLf

Explanation: Current crosspoint state is changed according to preset 4, including the mute state of the outputs.

Info: Locked outputs are left unchanged. Presets don't affect output locks.

8.4.12. Preview preset

Description: Preview preset <id> without loading.

Format	**Example** (MX16x16DVI-Plus)
Command {VP#<id>=?}	→ {vp#3=?}
Response (VP#<id>=●<O1>●<O2> ●<O3>●<O4>●<O5>●<O6> ●<O7>●<O8>●<O9>●<O10> ●<O11>●<O121>●<O13> ●<O14>●<O15>●<O16>)CrLf	← (VP#3= 02 M02 M01 02 02 01 01 01 01 01 01 01 01 01 01 01)CrLf

Legend: Any <Ox> indexes can be a two digit number, or there can be a leading character showing the mute state for the corresponding output.

Explanation: Viewing connections for preset 3. Input 2 is connected to outputs 1, 2, 4 and 5. Input 1 is connected to all other outputs. Outputs 2 and 3 are muted. The shown input connections for these outputs are not active, but the last connection that was routed to that output before it was muted.

Index	Legend	Explanation
<Ox>	<in²>	<Ox> is connected to <in²>, <Ox> is not muted.
<Ox>	M<in²>	<Ox> is connected to <in²>, <Ox> is muted.

Renaming Presets / Inputs / Outputs

Description: Allows storing names for each preset / input / output. Any 16-byte long string is allowed. All characters are converted to uppercase! The router accepts <id> greater than the current I/O setup but treats it as modulo output. So if <id> = 17 on a 16x16 router, then it will be treated as 1. All router models have 32 presets memories.

8.4.13. Rename a preset

Format	Example
Command {PNAME#<id>= <preset_name>}	→ {pname#1=first preset}
Response (PNAME#<id>= <preset_name>)CrLf	← (PNAME#1=FIRST PRESET)CrLf

Explanation: Preset 1 was named as "first preset".

8.4.14. Rename an input

Format	Example
Command {INAME#<id>= <input_name>}	→ {iname#3=Media Player}
Response (INAME#<id>= <input_name>)CrLf	← (INAME#3=MEDIA PLAYER)CrLf

Explanation: Input 3 was named as "media player".

8.4.15. Rename an output

Format	Example
Command {ONAME#<id>= <output_name>}	→ {oname#2=Monitor_no2}
Response (ONAME#<id>= <output_name>)CrLf	← (ONAME#2=MONITOR_NO2)CrLf

Explanation: Output 2 was named as "monitor_no2".

Query names of Presets / Inputs / Outputs

Description: Each preset / input / output name can be read from the router.

8.4.16. Read a preset's name

Format	Example
Command {PNAME#<id>=?}	→ {pname#1=?}
Response (PNAME#<id>= <preset_name>)CrLf	← (PNAME#1=FIRST PRESET)CrLf

Explanation: Name for preset 1 is "first preset".

8.4.17. Read an input's name

Format	Example
Command {INAME#<id>=?}	→ {iname#3=?}
Response (INAME#<id>=<input_name>)CrLf	← (INAME#3=MEDIA PLAYER)CrLf

Explanation: Name for input 3 is "media player".

8.4.18. Read an output's name

Format	Example
Command {ONAME#<id>=?}	→ {oname#2=?}
Response (ONAME#<id>=<output_name>)CrLf	← (ONAME#2=MONITOR_NO2)CrLf

Explanation: Name for output 2 is "monitor_no2".

Set default names of Presets / Inputs / Outputs

Description: Renames **all** preset / input / output names to the default: Preset 1..32 / Input 1..16 / Output 1..16 respectively.

*Info: The <id> field is not relevant here, only has to be a valid one. The command will affect **ALL** Presets / Inputs / Outputs disregarding the actual number that was in the command.*

8.4.19. Reload default preset names

Format	Example
Command {PNAME#<id>=!}	→ {pname#2=!}
Response (PNAME#<id>=Preset<id>)CrLf	← (PNAME#2=Preset 2)CrLf

*Info: Preset names will be renamed to the factory defaults but will not refreshed in the Lightware Device Controller software. Please click on the **Read preset names** button to refresh all the preset names.*

8.4.20. Reload default input names

Format	Example
Command {INAME#<id>=!}	→ {iname#4=!}
Response (INAME#<id>=Input<id>)CrLf	← (INAME#4=Input 4)CrLf

*Info: Input names will be renamed to the factory defaults but will not refreshed in the Lightware Device Controller software. Please right click on one input name and choose the **Read I/O names** item to refresh all the input names.*

8.4.21. Reload default output names

Format	Example
Command {ONAME#<id>=!}	→ {oname#3=!}
Response (ONAME#<id>= Output<id>)CrLf	← (ONAME#3=Output 3)CrLf

*Info: Output names will be renamed to the factory defaults but will not refreshed in the Lightware Device Controller software. Please right click on one output name and choose the **Read I/O names** item to refresh all the output names.*

8.4.22. Reload factory default output setup

Description: Reload factory defaults.

Format	Example
Command {r00}	→ {r00}
Response (APWSE)CrLf	← (APWSE)CrLf

8.4.23. Query IP settings

Description: IP setup can be retrieved from the router with this command.

Format	Example
Command {IP_CONFIG=?}	→ {ip_config=?}
Response (IP_CONFIG=<id> ●<ip_address>●<port> ●<mask>●<gateway>)CrLf	← (IP_CONFIG=0 192.168.2.106 10001 255.0.0.0 192.168.2.1)CrLf

Legend:

Identifier	Description	Default value
<id>	0-fix IP, 7-DHCP	0
<ip_address>	IP address	192.168.254.254
<port>	IP port of the router	10001
<mask>	subnet mask	255.255.0.0
<gateway>	gateway address	0.0.0.0

Explanation: The router has a fix 192.168.2.106 IP address on the 255.0.0.0 subnet with a gateway on 192.168.2.1 and communicates over port no. 10001.

Info: If the matrix responds only zeros for this command, please unplug from power source, reconnect and try again.

8.4.24. Reload factory default IP settings

Description: After issuing this command over serial connection the router will reload the factory default IP setup.

Format		Example
Command	{IP_CONFIG=!}	→ {ip_config=!}
Response	(Changing●IP● configuration…)CrLf (DONE!)CrLf or (FAILED!)CrLf	← (Changing IP configuration…)CrLf ← (DONE!)CrLf or (FAILED!)CrLf

Parameters after successful command execution:

Parameter	Value
IP address	192.168.254.254
port number	10001
Subnet mask	255.255.0.0
Gateway	0.0.0.0

Info: IP settings can NOT be changed with this protocol command via Ethernet connection, only via serial port. To change the IP settings via Ethernet, use the Lightware Device Controller software (section 5.9.1 on page 38) or the built-in website (section 6.4). Default settings can be reloaded by the front panel buttons as well (section 4.3.5).

8.4.25. Load DHCP IP settings (only IP address!)

Description: After issuing this command over serial connection the router will inquire IP address with DHCP.

Format		Example
Command	{IP_CONFIG=D}	→ {ip_config=D}
Response	(Changing●IP● configuration…)CrLf (DONE!)CrLf or (FAILED!)CrLf	← (Changing IP configuration…)CrLf ← (DONE!)CrLf or (FAILED!)CrLf

Parameters after successful command execution:

Parameter	Value
IP address	Acquired with DHCP
port number	unchanged
Subnet mask	unchanged
Gateway	unchanged

Info: IP settings can NOT be changed with this protocol command via Ethernet connection, only via serial port. To change the IP settings via Ethernet, use the Lightware Device Controller software (section 5.9.1 on page 38 or the built-in website (section 6.4 on page 48). Default setting can be reloaded by the front panel buttons as well (section 4.3.5 on page 22).

8.4.26. View LAN versions

Description: Shows information about the LAN interface.

Format		Example
Command	{LAN_VER=?}	→ {lan_ver=?}
Response	(MAC_ADDR=<mac>)CrLf (WEB_VER=<ver1>)CrLf (SERVER_VER=<ver2>)CrLf	← (MAC_ADDR=00-20-4A-E3-1D-E42)CrLf ← (WEB_VER=1.4.0)CrLf ← (SERVER_VER=1.1.5)CrLf ←

Legend: <mac> stands for the active protocol.
<ver1> Version of built-in website user interface (webcontent).
<ver2> Version of LAN controller firmware (webserver).

Explanation: MAC address, webcontent and webserver versions are shown.

8.5. Port status commands

8.5.1. Input port status

Description: Shows the actual status of the input ports.

Format	**Example** (MX16x16DVI-Plus)
Command {:ISD} Response (ISD●<INPUT_D>)CrLf	→ {:isd} ← (ISD 1000000010010001 0000000000000000)CrLf

Explanation: Input 1, 9, 12 and 16 has a connected source.

Legend: <INPUT_D> always contains 32 decimal numbers but the first 16,12 or 9 are valid only. (It depends on the matrix size). Each number represents the state for the corresponding input port:

- 0: There is no connected source or does not send 5V
- 1: The connected source is connected and sends 5V

8.5.2. Output port status

Description: Shows the actual status of the output ports.

Format	**Example** (MX16x16DVI-Plus)
Command {:OSD} Response (OSD●<OUTPUT_D>)CrLf	→ {:osd} ← (OSD 1000000010010001 0000000000000000)CrLf

Explanation: There are four DVI sinks connected on ports 1,9,12 and 16. No other output port is connected.

Legend: <OUTPUT_D> always contains 32 decimal numbers but the first 16,12 or 9 are valid only. Each number represents the state for the corresponding output port.

- 0: There is no connected DVI sink or does not send Hotplug signal
- 1: Hotplug signal is presented by the connected device

8.6. Router Status commands

8.6.1. View product type

Description: The router responds its name.

Format	Example(MX16x16DVI-Plus)
Command {I}	→ {i}
Response (<PRODUCT_TYPE>)CrLf	← (MX16x16DVI-Plus)CrLf

Legend:

<PRODUCT_TYPE>	inputs	outputs	interface
MX16x16DVI-Plus	16	16	single link
MX12x12DVI-Plus	12	12	single link
MX9x9DVI-Plus	9	9	single link

Explanation: The connected device is an MX16x16DVI-Plus.

8.6.2. View serial number

Description: The router responds its 8-digit serial number.

Format	Example
Command {S}	→ {s}
Response (<SERIAL_NUMBER>)CrLf	← (SN:10170142)CrLf

Info: Only the last 4 numbers are written onto the back of the router

8.6.3. View Firmware version of the CPU

Description: View the CPU firmware revision. To view other controller's firmware version see {FC} command (section 8.6.6 on page 63).

Format	Example
Command {F}	→ {f}
Response (<FW_VERSION>)CrLf	← (FW:2.4.8)CrLf

Legend: <FW_VERSION> is the firmware version.

8.6.4. View CPU firmware compile time

Description: Shows the CPU firmware compile time.

Format		Example	
Command	{CT}	→	{ct}
Response	(Compiled:<DATE>●<TIME>● Build:<tag>)CrLf	←	(Compiled: Aug 29 2012 17:39:36, build: 1624)CrLf

Legend:

<DATE>	Month, Day and Year
<TIME>	Hours, minutes and seconds
<tag>	Identification number of the firmware

Explanation: The firmware was made in 29.08.2012, 17:39:36 and the identification number of the firmware is 1624.

8.6.5. View Installed I/O cards' hardware

Description: Shows the hardware name and revision of the installed cards.

Info: This router model is a compact type, so there are no separate input / output cards. Separate card slot descriptors are listed only because of compatibility issues.

Format		Example (MX16x16DVI-Plus)
Command	{IS}	→ {is}
Response	(SL#●0● <MB_DESC>)CrLf	← (SL# 0 MX16X16DVI-PLUS SCH_2.5 PCB_2.5)CrLf
	(SL#●1●<OB_DESC>)CrLf	← (SL# 1 MX16x16DVI-PLUS-OB SCH_2.5 PCB_2.5)CrLf
	(SL#●2●<OB_DESC>)CrLf	← (SL# 2 MX16x16DVI-PLUS-OB SCH_2.5 PCB_2.5)CrLf
	(SL#●3●<OB_DESC>)CrLf	(SL# 3 Empty Slot)CrLf
	(SL#●4●<OB_DESC>)CrLf	← (SL# 4 Empty Slot)CrLf
	(SL#●5●<IB_DESC>)CrLf	← (SL# 5 MX16x16DVI-PLUS-IB SCH_2.5 PCB_2.5)CrLf
	(SL#●6●<IB_DESC>)CrLf	← (SL# 6 MX16x16DVI-PLUS-IB SCH_2.5 PCB_2.5)CrLf
	(SL#●7●<IB_DESC>)CrLf	← (SL# 7 Empty Slot)CrLf
	(SL#●8●<IB_DESC>)CrLf	(SL# 4 Empty Slot)CrLf
		←
		←

Explanation (MX16x16DVI-Plus router): The router reports as if it has two output ad two input cards.

8.6.6. View installed controllers' firmware

Description: Shows the firmware revisions of the installed controllers.

Format		Example
Command	{FC}	→ {fc}
Response	(<CARD_FIRMWARE>)CrLf	← (CF MX-CP FW:1.0.8 @ 0x10)CrLf ← (CF MX-DVI-EDID FW:3.2.3 @ 0x50)CrLf

8.6.7. View current control protocol

Description: Shows the RS-232, TCP/IP control protocol.

Format		Example
Command	{P_?}	→ {p_?}
Response	CURRENT●PROTOCOL●=●#<x>)CrLf	← (CURRENT PROTOCOL = #1)CrLf

Legend: <x> stands for the active protocol.

Explanation: Protocol 1 is active here.

8.6.8. Set current control protocol

Description: Sets the current RS-232, TCP/IP control protocol (Default is '1').

Format	Example
Command {P_x} Response (PROTOCOL●#<x>● SELECTED!)CrLf	→ {p_1} ← (PROTOCOL #1 SELECTED!)CrLf

Legend: <x> stands for the selected protocol.

Explanation: Protocol 1 is activated.

8.6.9. View error list

Description: Shows the error list since last boot up.

Format	Example
Command {ELIST=?} Response (<class>,<e_desc>,<e_code>, <e_occ>)CrLf … (<class>,<e_desc>,<e_code>, <e_occ>)CrLf	→ {elist=?} ← (0,BOOT,00,1) CrLf … (0,BOOT,08,2) CrLf ←

Legend:
<class>: class of the error
<e_desc>: short description of the error
<e_code>: short device address in HEX format
<e_occ>: occurrence number for this type of log entry

Info: The error list can contain NOTICEs and WARNINGs under normal operation. These entries do not mean that there is any problem with the matrix!

8.6.10. View all error lists

Description: Shows all the error lists.

Format	Example
Command {ELIST=A} Response (<class>,<e_desc>,<e_code>, <e_occ>)CrLf … (<class>,<e_desc>,<e_code>, <e_occ>)CrLf	→ {elist=a} ← (0,BOOT,00,1) CrLf … *(0,BOOT,08,2)*CrLf ←

Legend:
<class>: class of the error
<e_desc>: short description of the error
<e_code>: short device address in HEX format
<e_occ>: occurrence number for this type of log entry

Info: The error list can contain NOTICEs and WARNINGs under normal operation. These entries do not mean that there is any problem with the matrix!

8.6.11. Clear error list

Description: Clear all the error lists.

Format	Example
Command {ELIST=!} Response (List●is●Empty!)CrLf	→ {elist=!} ← (List●is●Empty!)CrLf

Explanation: All error lists are cleared.

8.7. EDID router commands

The EDID router manipulates the EDID memory, which has memory locations that are assigned to specific input or output ports. Please see section 7 on page 51 about EDID memory structure.

8.7.1. Route EDID to the selected input (static)

Description: Copies EDID from location <loc> to input <in>. <loc> must be 1..100.

Format	Example
Command {<in>:<loc>} Response (E_SW_OK)CrLf …delay… (E_S_C) CrLf	→ {5:10} ← (E_SW_OK)CrLf …delay… ← (E_S_C) CrLf

Explanation: EDID from memory location 10 is copied to input 5.

Note: The router sends (E_S_C) only if the new EDID is different from the earlier one.

8.7.2. Route EDID to the selected input (dynamic)

Description: Copies EDID from location <loc> to input <in>. Location <loc> should be 101...116 (MX16x16DVI-Plus) or 101...112 (MX12x12DVI-Plus) or 101…109 (MX9x9DVI-Plus) as opposed to static routing where <loc> should be between 1..100.

Format	Example
Command {<in>:<loc>} Response (E_SW_OK)CrLf …delay… (E_S_C) CrLf	→ {4:102} ← (E_SW_OK)CrLf …delay… ← (E_S_C) CrLf

Info: Outputs 1..16 are mapped to logical addresses 101..116.

Explanation: EDID from output 2 is copied to input 4.

After choosing dynamic EDID routing to one (or all inputs) the router will follow the EDID changes occurring on the output it was connected to. Every time a different EDID is recognized on the output, it is copied instantly to the input.

8.7.3. Route one EDID to all inputs

Description: Copies EDID from the selected location <loc> to all inputs. Location <loc> should be between 1..100 for static routing and between 101..116 for dynamic routing.

Format		Example
Command	{A:<loc>}	→ {a:48}
Response	(E_SW_OK)CrLf	← (E_SW_OK)CrLf
	…delay…	…delay…
	(E_S_C) CrLf	← (E_S_C) CrLf

Explanation: EDID from memory location 48 is copied to all inputs.

Info: This operation takes about 10 seconds.

8.7.4. View EDID switch status on all inputs

Description: Indexes show the actual input and the number at the given index (<in1>..<inN>) shows which EDID is switched to that particular input where N represents the maximal input number of the given configuration.

Format		**Example 1** (MX16x16DVI-Plus)
Command	{VEDID}	→ {vedid}
Response	(VEDID●<IN1>●<IN2>● <IN3>●<IN4>●<IN5>● <IN6>●<IN7> ●<IN8>● <IN9>●<IN10>●<IN11>● <IN12>●<IN13>●<IN14>● <IN15>●<IN16>)CrLf	← (VEDID 048 048 053 101 101 101 101 101 101 101 101 101 101 101 101 101)CrLf

Legend: Any <INx> indexes are **three digit** numbers showing the current EDID that is routed to the corresponding input. Respond length depends on input number of the router.

Explanation: Factory preset EDID from memory location 48 is emulated on inputs 1 and 2. User saved EDID from memory location 53 is emulated on input 3. EDID from output 1 is dynamically emulated on all other inputs.

8.7.5. Save EDID from output to memory location (Learn EDID)

Description: Learn EDID from the specified output <out> to the specified location <loc>. Memory locations 51..100 are available for saving learned EDIDs.

Format		Example
Command	{<out>**>**<loc>}	→ {4>51}
Response	(E_SW_OK)CrLf	← (E_SW_OK)CrLf
	(E_S_C) CrLf	← (E_S_C) CrLf

Explanation: EDID from output 4 is saved to EDID memory location 51.

8.7.6. View EDID validity table

Description: Shows EDID validity table, which contains information about the EDID states.

Format	**Example** (MX16x16DVI-Plus)
Command {WV} Response (EV●<VALIDITY_TABLE>)CrLf	→ {wv} ← (EV **1111111111111111111111111** ← **1111111111111111111111111**111 0000000000000000000000000 0000000000000000010*11111111* *1111111000000000000000****11113*** ***1111111111000000000000000***)CrLf

Legend: Response length is 164 characters. Each number represents the EDID validity state for the corresponding memory location. The first 50 numbers (bold) are representing the factory preset EDIDs, the second 50 numbers are representing the User saved EDIDs. From the next 32 numbers the first 16* (italic) are showing the outputs' EDID state, and from the last 32 numbers the first 16* (bold and italic) are showing the emulated EDIDs on the inputs.

* The number depends on the matrix size. (16, 12 or 9)

Value	**Description**
'0'	invalid EDID
'1'	valid EDID
'3'	changed EDID

If a changed EDID is queried by the {wh} command (see the next section), its value returns to '1'.

Explanation: There is one '3' in the table on the 137th position. This means that the emulated EDID on input 5 is changed since the last EDID query on that port.

8.7.7. View EDID header

Description: EDID_HEADER consists of 3 fields:

PNPID code The three letter abbreviation of the manufacturer

Preferred resolution The resolution and refresh rate stored in the preferred detailed timing block.

Name The name of display device stored in product descriptor.

Format	**Example**
Command {WH<loc>} Response (EH#<loc>● <EDID_HEADER>)CrLf	→ {wh104} ← (EH#104 NEC 1280x1024@60 LCD1970NXp)

Explanation: Shows the EDID from memory location 104.

8.7.8. Download EDID content from the router

Description: EDID hex bytes can be read directly. The router will issue the whole content of the EDID present on memory location <loc> (256 bytes).

Format		Example
Command	{WE<loc>}	→ {we1>}
Response	(EB#<loc>●<B1> ●<B2>●..●<B256>)CrLf	← (*EB#1 00 FF FF FF FF FF FF 00 32 F2 00 00 00 .. .. .. 00 92*) CrLf

Legend: <B1>..<B256> are space separated hex characters represented in ASCII format.

Explanation: Full EDID from memory location 1 is downloaded.

8.7.9. Upload EDID content to the router

Description: EDID hex bytes can be written directly to the user programmable memory locations (locations #51...#100).

Sequence:

Step 1. Prepare the router to accept EDID bytes to the specified location <loc> with command *{WL#<loc>}*

Step 2. Router responds that it is ready to accept EDID bytes with *(E_L_S)CrLf*

Step 3. Send 1 block of EDID (1 block consist of 8 bytes of hex data represented in ASCII format) with command *{WB#<num>●<B1>●<B2>●<B3>●<B4>●<B5>●<B6>●<B7>●<B8>}*

Step 4. The router acknowledges with response *(EL#<num>)*

Step 5. Repeat steps 3 and 4 to send the remaining 31 blocks of EDID (32 altogether)

Step 6. After the last acknowledge, the router indicates that the EDID status changed by sending *(E_S_C) CrLf*

Format		Example
Command	{WL#<loc>}	→ {WL#53}
Response	(E_L_S)CrLf	← (E_L_S) CrLf
Command	{WB#1●<B1>●<B2>●<B3>●<B4>●<B5>●<B6>●<B7>●<B8>}	→ {WB#1 00 FF FF FF FF FF FF 00}
Response	(EL#<num>)CrLf	← (EL#1) CrLf
Command	{WB#2●<B9>●<B10>●<B11>●<B12>●<B13>●<B14>●<B15>●<B16>}	→ {WB#2 38 A3 8E 66 01 01 01 01}
Response	(EL#<num>) CrLf	← (EL#2) CrLf
	⋮	⋮
Command	{WB#32●<B249>●<B250>●<B251>●<B252>●<B253>●<B254>●<B255>●<B256>}	→ {WB#32 36 59 42 0A 20 20 00 96}
Response	(EL#<num>) CrLf	← (EL#32) CrLf
Response	(E_S_C) CrLf	← (E_S_C) CrLf

Legend: <num> represents the sequential number of every 8 byte part of EDID. <num> is between 1 and 32. <B1>..<B256> are the bytes of EDID.

Explanation: Full EDID uploaded to memory location 53.

8.7.10. Delete all EDID from memory

Description: Clear all User, Emulated and Last attached Monitor's EDIDs.

Format	Example
Command {:CLREDID} Response (E_S_C)CrLf	→ {:clredid} ← (E_S_C)CrLf

Explanation: All EDIDs are cleared expecting the factory ones.

8.8. Router initiated commands

8.8.1. Restart CPU controller

Description: The CPU controller can be restarted without unplugging power.

Format	**Example** (MX16x16DVI-Plus)
Command {RST}	→ {rst}
Response (CPU_RESET…)CrLf (<name>●Ready!)CrLf	← (CPU_RESET…)CrLf ← (MX16x16DVI-Plus Ready!)

Legend: *<name>* is the type of the matrix

Explanation: The matrix reboots and sends a message when it is ready.

Info: The response can be seen only if the connection to the router is still alive.

8.8.2. Restart EDID controller

Description: The EDID controller can be restarted without unplugging power.

Format	**Example** (MX16x16DVI-Plus)
Command {:RST}	→ {:rst}
Response (Booting…)CrLf	← (Booting...)CrLf
(BOOT●SLOT●1●STARTED)CrLf	← (BOOT SLOT 1 STARTED)
(SL#●1●<OB_DESC>)CrLf	← (SL# 1 MX16X16DVI-PLUS-OB SCH_2.5 PCB_2.5)
(SL#●1●<OB_DESC>)CrLf	← (SL# 1 MX16X16DVI-PLUS-OB SCH_2.5 PCB_2.5)
(BOOT●SLOT●1●FINISHED)CrLf	← (BOOT SLOT 1 FINISHED)
…	…
(BOOT●SLOT●8●STARTED)CrLf	← …
(BOOT●SLOT●8●FINISHED)CrLf	← (BOOT SLOT 8 STARTED) (BOOT SLOT 8 FINISHED)

Explanation (MX16x16DVI-Plus router): The router reports as if it restarted all output and input cards.

Info: The response can be seen only if the connection to the router is still alive.

8.8.3. EDID status changed

Description: This is sent after all commands which changes the EDID (EDID copy, EDID switch), or after a new EDID source e.g. a new display device is connected to the router.

Format	Example
Command *various* Response (E_S_C) CrLf	→ {5:101} ← (E_SW_OK)CrLf ← (E_S_C) CrLf ←

Explanation: Copy EDID from output 1 to input 5 (dynamic emulation). First response confirms the EDID routing command. (E_S_C) response is an automatic message that is sent because an EDID has changed.

Info: The router stores the last attached display device's EDID connected to the output. After disconnecting this device its EDID is still present at the router's memory, therefore no status change message is issued by the router if a display device having the same EDID is connected to that output. (The same display device is connected again, or another display device (same brand) from the same manufacturer)

Info: To keep your application in sync with the router it is recommended to issue a show validity ({wv}) command after receiving an EDID status changed response, and read all location indicating '3' in the table, as the change of these EDID triggered the EDID status changed response.

8.8.4. Error responses

Invalid input number

Description: Given input number exceeds the maximum number of inputs or equals zero.

Response (ERR01)CrLf

Invalid output number

Description: Given output number exceeds the installed number of outputs or equals zero.

Response (ERR02)CrLf

Invalid value

Description: Given value exceeds the maximum allowed value can be sent.

Response (ERR03)CrLf

Invalid preset number

Description: Given preset number exceeds the maximum allowed preset number.

Response (ERR04)CrLf

Info: The maximum preset number is limited to 32 for all routers.

9. Commands – Quick summary

Switching and control commands

Command description	See in chapter	Command
Switch one input to one output	8.4.1	{<in>@<out>}
Switch one input to all outputs	8.4.2	{<in>@O}
View connection on the specified output	8.4.3	{?<out>}
View connection on all outputs	8.4.4	{VC}
View mutes on all outputs	8.4.5	{VM}
Mute specified output	8.4.6	{#<out>}
Unmute specified output	8.4.7	{+<out>}
Lock specified output	8.4.8	{#><out>}
Unlock specified output	8.4.9	{+<<out>}
Save preset to the specified memory location	8.4.10	{$<id>}
Load preset from the specified location	8.4.11	{%<id>}
Preview preset	8.4.12	{VP#<id>=?}
Rename a preset	8.4.13	{PNAME#<id>=<preset_name>}
Rename an input	8.4.14	{INAME#<id>=<input_name>}
Rename an output	8.4.15	{ONAME#<id>=<output_name>}
Read a preset's name	8.4.16	{PNAME#<id>=?}
Read an input's name	8.4.17	{INAME#<id>=?}
Read an output's name	8.4.18	{ONAME#<id>=?}
Reload default preset names	8.4.19	{PNAME#<id>=!}
Reload default input names	8.4.20	{INAME#<id>=!}
Reload default output names	8.4.21	{ONAME#<id>=!}
Reload factory default output setup	8.4.22	{r00}
Query IP settings	8.4.23	{IP_CONFIG=?}
Reload factory default IP settings	8.4.24	{IP_CONFIG=!}
Load DHCP IP settings (only IP address!)	8.4.25	{IP_CONFIG=D}
View LAN versions	8.4.26	{LAN_VER=?}

Port status commands

Command description	See in chapter	Command
Input port status	8.5.1	{:ISD}
Output port status	8.5.2	{:OSD}

Router Status commands

Command description	See in chapter	Command
View product type	8.6.1	{I}
View serial number	8.6.2	{S}
View Firmware version of the CPU	8.6.3	{F}
View CPU firmware compile time	8.6.4	{CT}
View Installed I/O cards' hardware	8.6.5	{IS}
View installed controllers' firmware	8.6.6	{FC}
View current control protocol	8.6.7	{P_?}
Set current control protocol	8.6.8	{P_x}
View error list	8.6.9	{ELIST=?}
View all error lists	8.6.10	{ELIST=A}
Clear error list	8.6.11	{ELIST=!}

EDID router commands

Command description	See in chapter	Command
Route EDID to the selected input (static)	8.7.1	{<in>:<loc>}
Route EDID to the selected input (dynamic)	8.7.2	{<in>:<loc>}
Route one EDID to all inputs	8.7.3	{A:<loc>}
View EDID switch status on all inputs	8.7.4	{VEDID}
Save EDID from output to memory location (Learn EDID)	8.7.5	{<out>><loc>}
View EDID validity table	8.7.6	{WV}
View EDID header	8.7.7	{WH<loc>}
Download EDID content from the router	8.7.8	{WE<loc>}
Upload EDID content to the router	8.7.9	{WL#<loc>}
Delete all EDID from memory	8.7.10	{:CLREDID}

Router initiated commands

Command description	See in chapter	Command
Restart CPU controller	8.8.1	{RST}
Restart EDID controller	8.8.2	{:RST}

10. Firmware upgrade

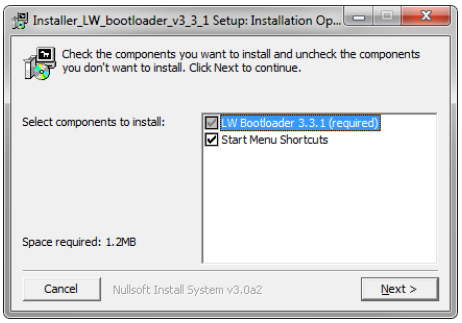
This chapter is meant to help customers perform firmware upgrades on our products by giving a few tips on how to start and by explaining the features of the Bootloader software.

10.1. Installing the Bootloader

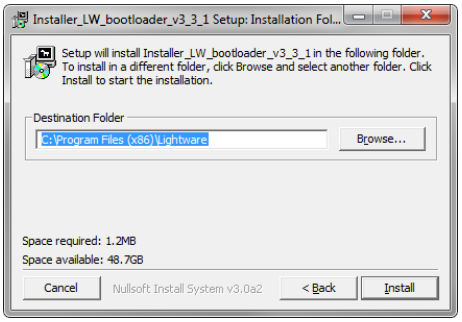
The matrix router can be upgraded using Lightware Bootloader from a Windows based PC or Laptop via Ethernet.

10.1.1. Installing and launching the Bootloader software

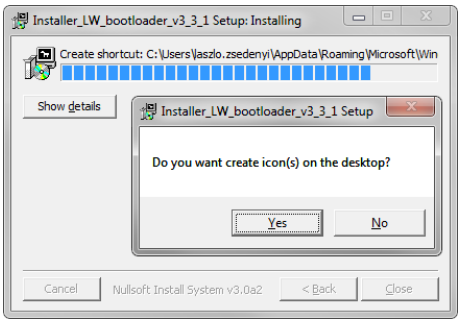
Step 1. Run Bootloader installer.


Installer_LW_bootloader_v3_3_1 Setup: Installation Op...
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select components to install:
LW Bootloader 3.3.1 (required)
Start Menu Shortcuts
Space required: 1.2MB
Cancel
Nullsoft Install System v3.0a2
Next >

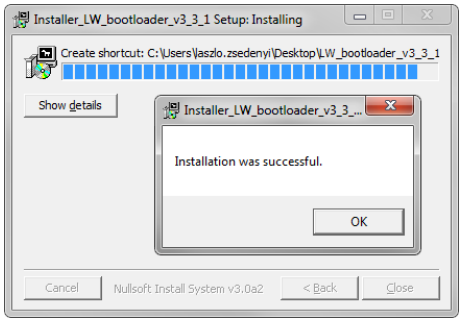
Step 2. Select destination folder and select Install (Using the default path is highly recommended)


Installer_LW_bootloader_v3_3_1 Setup: Installation Fol...
Setup will install Installer_LW_bootloader_v3_3_1 in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
C:\Program Files (x86)\Lightware
Browse...
Space required: 1.2MB
Space available: 48.7GB
Cancel
Nullsoft Install System v3.0a2
< Back
Install

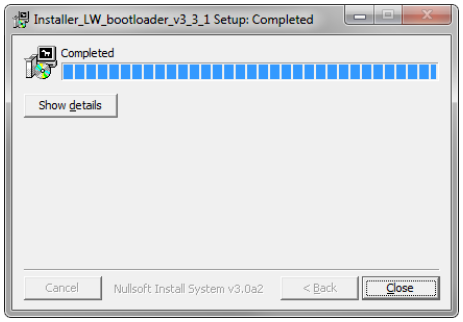
Step 3. If you want to create desktop icon select Yes in the next pop-up window:



Step 4. After the files have been copied, the following message appears:



Step 5. To finish the installation process, click on the Close button.



Step 6. To run Lightware Bootloader, find the shortcut icon in Start menu → Programs → Lightware → LW_bootloader_v3_3_1 or on the desktop, and double click on it.

Uninstalling

To uninstall the Bootloader software, double click on: Start menu → Programs → Lightware → Uninstall_LW_bootloader_v3_3_1.exe

10.2. Upgrade process

10.2.1. Tips for the upgrade process

Cross UTP connection

To avoid packet loss caused by an overloaded network, it is recommended to use cross UTP connection directly from the upgrading PC to the Lightware device.

Disable other Ethernet devices

The Bootloader software always queries the PC's primary Ethernet adapter (which is usually the adapter that is connected to the Internet) for available Lightware devices. It is recommended to disable every other Ethernet device (secondary LAN, Wi-Fi, 3G modem) for the time of the upgrade. If the Bootloader cannot find the Lightware device because the device is connected to the secondary Ethernet adapter (cross UTP connection), you need to disable the primary adapter (Internet). This way the Ethernet adapter which is connected to the Lightware device will become the primary adapter and the Bootloader can query it for Lightware devices. If you disable an Ethernet adapter while the Bootloader is running, you need to restart the Bootloader to be able to query the Ethernet adapter again.

A second option in this case is that if you know the IP address and port number of the Lightware device, you may use the Add IP button which is described in section 10.3.1 on page 75.

Remove I/O connections

It is recommended to remove all video input and output connections from the Lightware device. Video sources and display devices may try to communicate with the Lightware device or send noise through the cable which may interfere with the upgrade process.

Latest Bootloader

Always perform the firmware upgrade with the latest Bootloader software. To get the latest Bootloader software, contact your local sales representatives or Lightware's support team at support@lightware.eu

Finishing the process with older versions of the Bootloader

Bootloader versions that are older than v3.1.8 do not close the connection with the Lightware device automatically upon finishing the upgrade process. With these versions, if you remove the UTP cable or restart the Lightware device before you properly exit the Bootloader, the Lightware device will stay in a so called 'bootload mode' and will not return to normal operating mode. In such cases connect to the Lightware device with the Bootloader again and exit from it properly.

Restart the device

After a successful firmware upgrade, the device will restart itself but it is recommended to power down and up the device after finishing the upgrade.

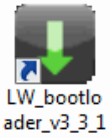
10.3.1. Firmware upgrade

Step 1. Connect the Lightware device and the computer via Ethernet (hub, switch, router) or Ethernet directly (with cross UTP cable).

If you are connecting via **hub, switch or router**, then you can either set the Lightware device to have a fix IP (in which case make sure that there is no IP conflict on the network) or you can set the Lightware device to DHCP mode (in which case the Lightware device will acquire an IP address automatically). In this case the network must have a DHCP server. These settings can be done from the front panel LCD menu or via the supplied Lightware Device Controller software. If you are connecting directly, via a cross UTP cable, you need to set up a fix IP and subnet mask on the Lightware device and the PC.

Step 2. Start the application.

To run the Bootloader software, double click on the icon of the software on the desktop or select proper shortcut from Start Menu → Programs → Lightware folder.



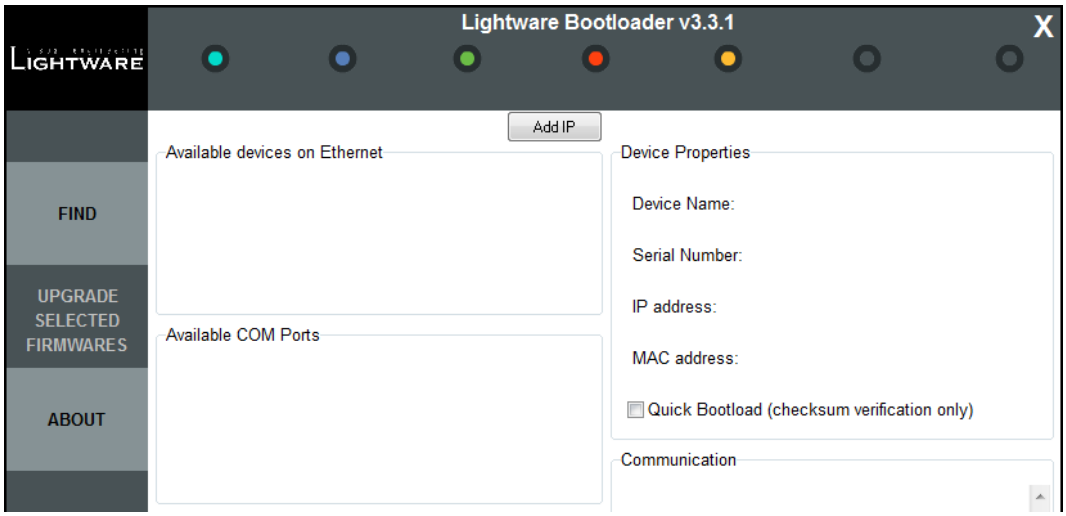


Figure 10-1. Bootloader software startup

Step 3. Find devices

Make sure that no active connection is made to the device (Lightware Device Controller software or web browser connected to the built-in website). Then click on the **FIND** button to query the Ethernet for Lightware devices.

Info: COM ports do not list any information about the connected devices, users must know which COM port is connected to the Lightware device.

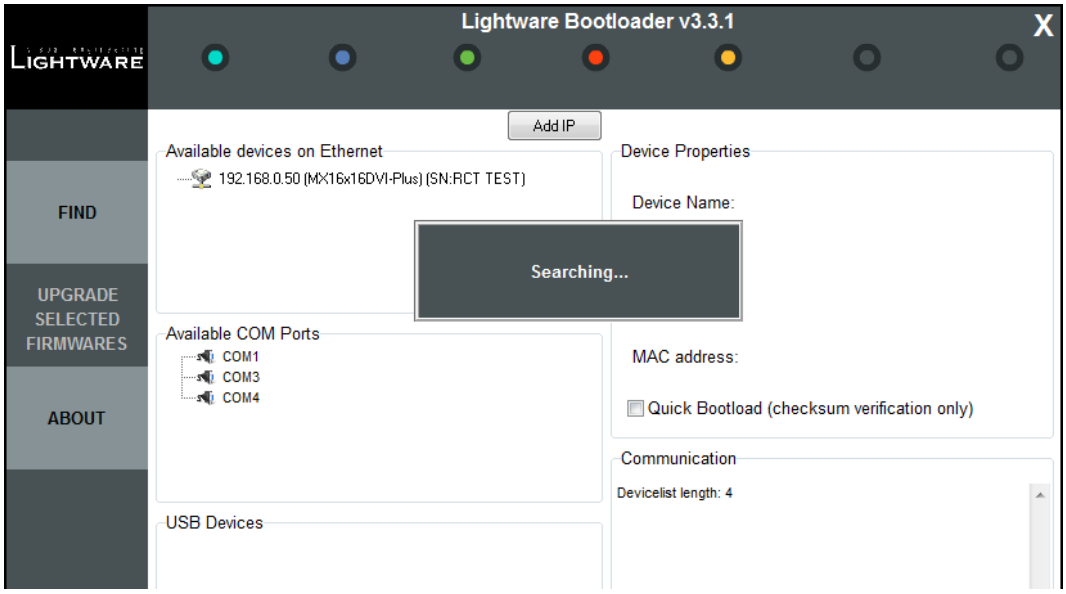


Figure 10-2. Searching for devices

The Bootloader software always queries the PC's primary Ethernet adapter (which is usually the adapter that is connected to the Internet) for available Lightware devices. It is recommended to disable every other Ethernet device (secondary LAN, Wi-Fi, 3G modem) for the time of the upgrade. If the Bootloader cannot find the Lightware device because the device is connected to the secondary Ethernet adapter (cross UTP connection), you need to disable the primary adapter (Internet). This way the Ethernet adapter which is connected to the Lightware device will become the primary adapter and the Bootloader can query it for Lightware devices. If you disable an Ethernet adapter while the Bootloader is running, you need to restart the Bootloader to be able to query the Ethernet adapter again.

A second option in this case is that if you know the IP address and port number of the Lightware device, you may use the Add IP button above the Available Devices on Ethernet window.

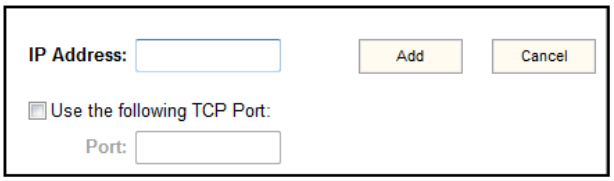


Figure 10-3. Add IP

If the Lightware device is connected to the secondary Ethernet adapter (or for any other reason) and the Bootloader doesn't list it in the available devices window, you can manually add its IP address and TCP Port number. This way the device name and IP address won't be displayed, but double clicking on the IP address will establish the connection.

Step 4. Connect to a device

If the Bootloader finds one or more Lightware devices then they will be listed in the tree view window. This window shows the device type, IP address and serial number of the found Lightware devices. COM ports do not query these information, users must know which COM port is connected to the Lightware device. Double click on one of the available devices. The Bootloader will ask if you really want to connect to the device. Select **YES** to establish the connection. It will take 10-15 seconds to get all the information from the Lightware device. After establishing the connection the device enters bootload mode and suspends normal operation.

Warning: *The bootloader application will hold the router in reset state when it establishes the connection. All connected DVI sources and monitors will act as if the router was powered down.*

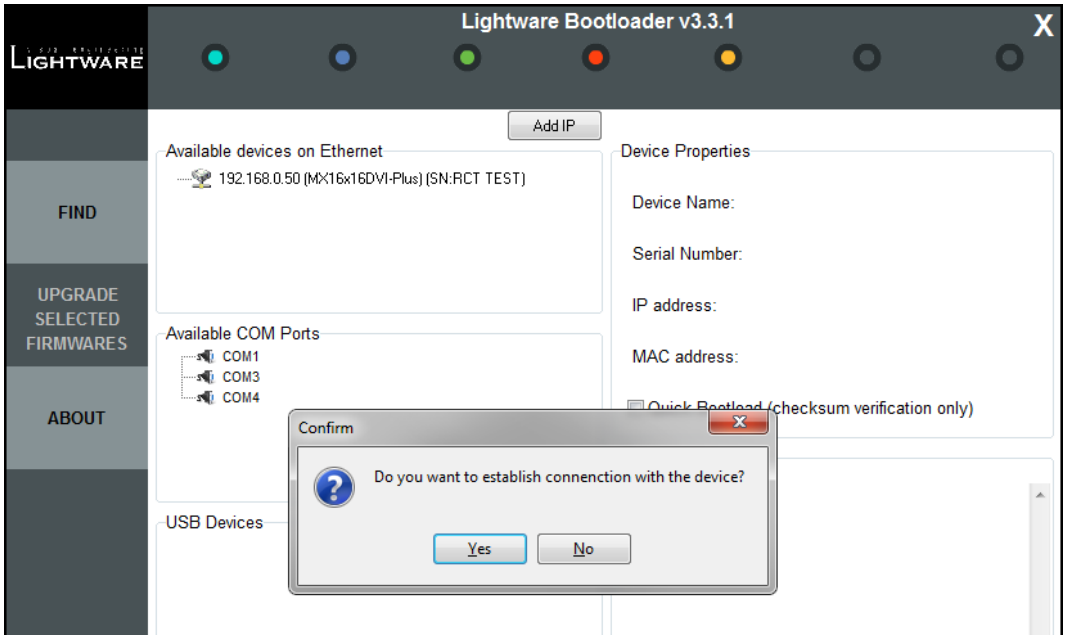


Figure 10-4. Establishing the connection

Step 5. Requesting device information

After clicking on the YES button, the device name, serial number, IP address, MAC Address and current firmware versions are displayed.

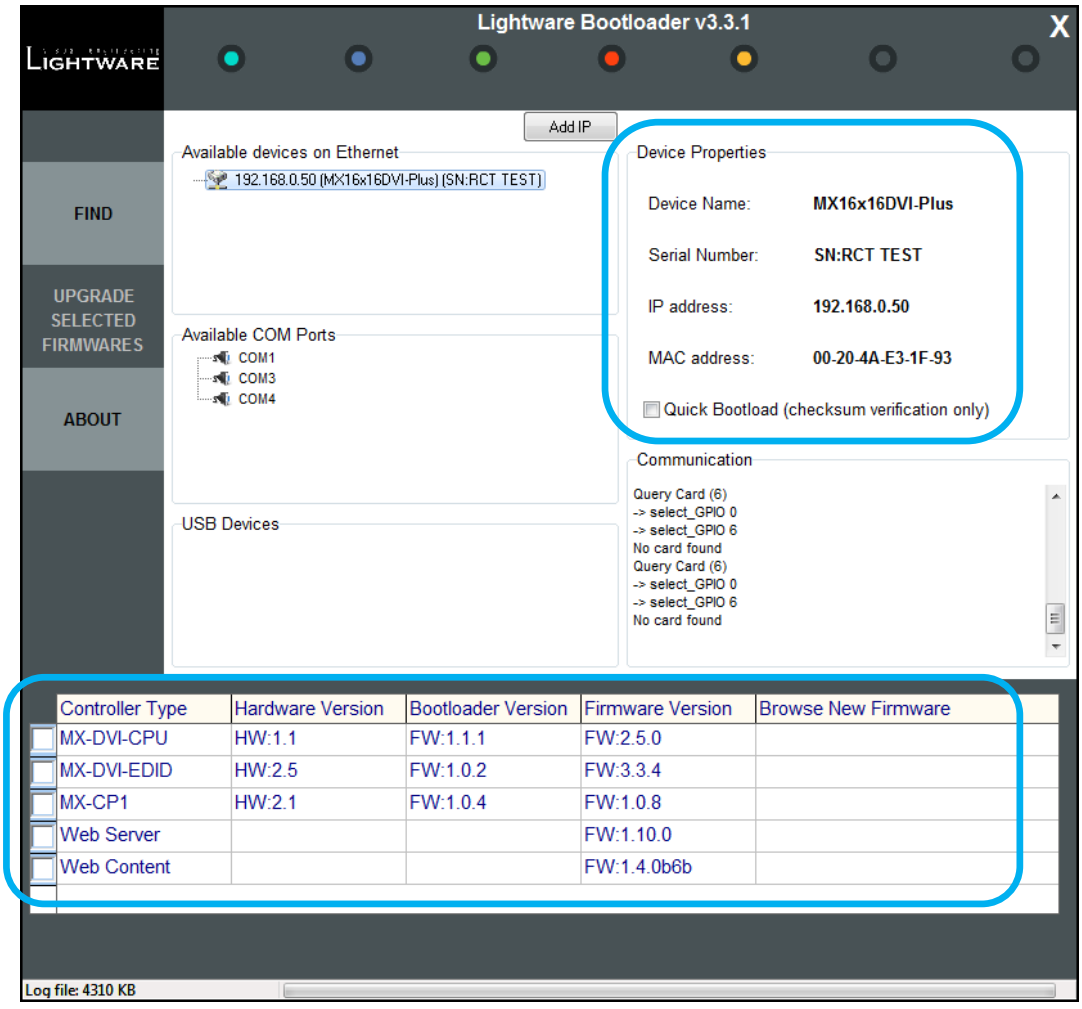


Figure 10-5. Details of the device

Step 6. Select firmwares to upgrade

To upgrade a firmware, click in the field in the line of the controller (marked with pink in the picture below). Click on **YES** in the pop-up window to modify the path to the new firmware file. Controller types are described in the table below. Now you can browse for the new firmware file to upload. After opening the new file, the new firmware field will contain the name of the firmware file.

Controller name	Description
MX-DVI-CPU	The main processor in the matrix.
MX-DVI-EDID	The EDID management handling processor
MX-CP1	Front side control panel for the matrix.
Web Server	The controller that handles Ethernet communication in devices with Ethernet port.
Web Content	The controller that handles the built-in website in devices with Ethernet port.

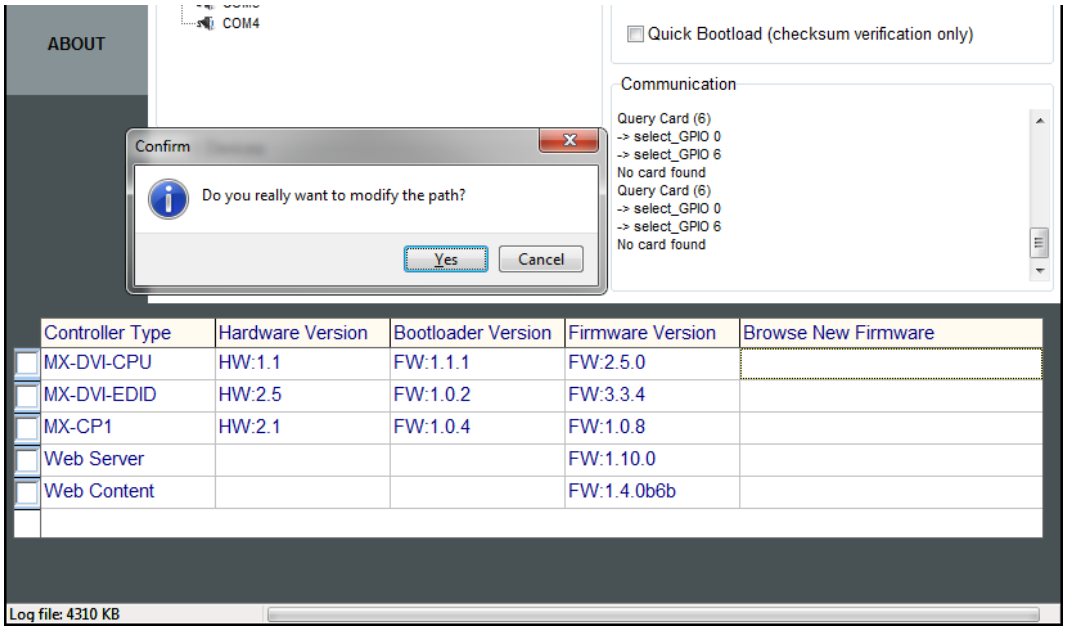


Figure 10-6. Selecting new firmware files

Step 7. Enable the upgrade and Quick Bootload mode

After selecting the new firmware file, you must enable the upgrade by clicking the checkbox left to the controller type (marked with a red rectangle in the picture below). You may enable Quick Bootload mode by clicking the checkbox next to it (marked with a blue rectangle in the picture below). Quick Bootload mode speeds up the process by not reading back the written data, only verifying the checksum. It can be enabled and disabled any time during the upgrade process.

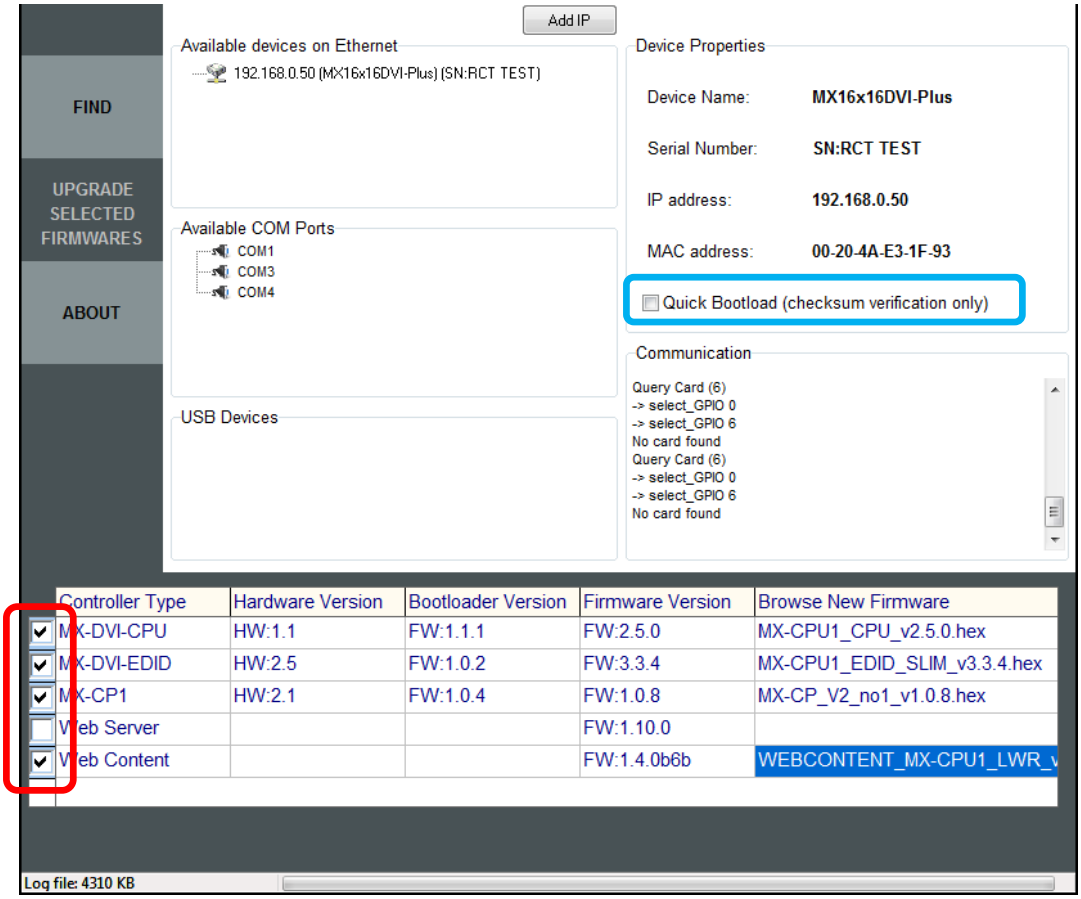


Figure 10-7. Enabling the upgrade and Quick Bootload mode

Step 8. Starting the upgrade process

After selecting all the firmwares which have to be upgraded, click on the **UPGRADE SELECTED FIRMWARES** button. Then click on **YES** in the appearing window to start the process.

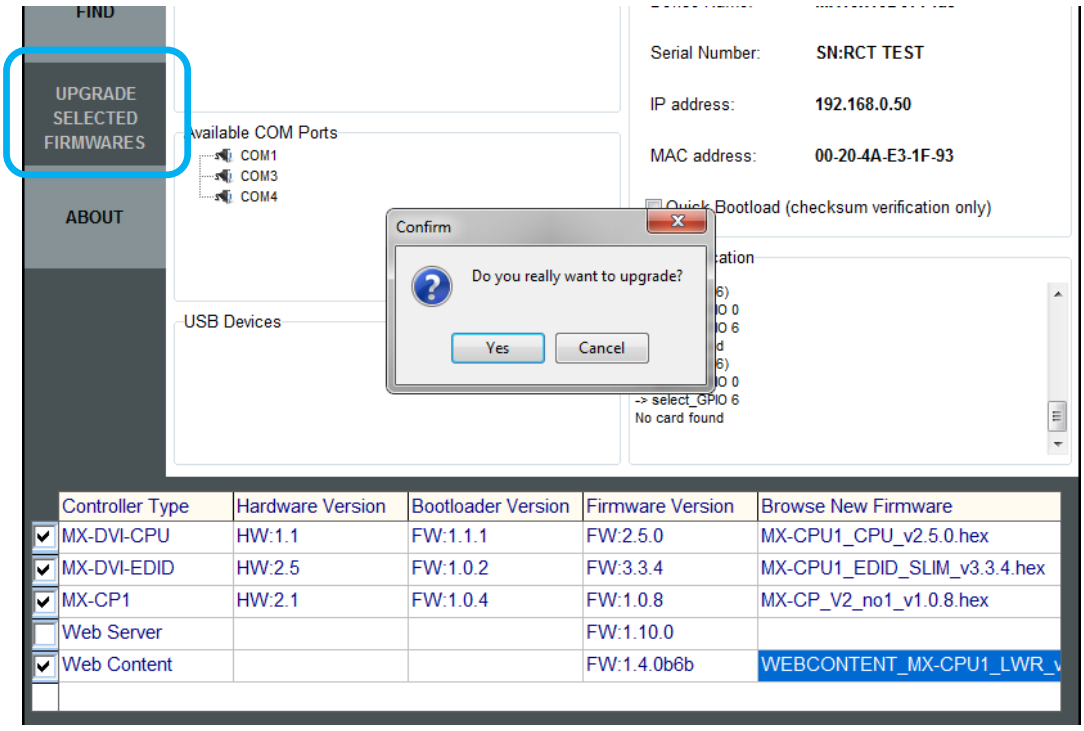

FIND
UPGRADE SELECTED FIRMWARES
ABOUT
Serial Number: SN:RCT TEST
IP address: 192.168.0.50
MAC address: 00-20-4A-E3-1F-93
Confirm
Do you really want to upgrade?
Yes
Cancel
USB Devices
No card found
Controller Type | Hardware Version | Bootloader Version | Firmware Version | Browse New Firmware
MX-DVI-CPU | HW:1.1 | FW:1.1.1 | FW:2.5.0 | MX-CPU1_CPU_v2.5.0.hex
MX-DVI-EDID | HW:2.5 | FW:1.0.2 | FW:3.3.4 | MX-CPU1_EDID_SLIM_v3.3.4.hex
MX-CP1 | HW:2.1 | FW:1.0.4 | FW:1.0.8 | MX-CP_V2_no1_v1.0.8.hex
Web Server | | | FW:1.10.0 |
Web Content | | | FW:1.4.0b6b | WEBCONTENT_MX-CPU1_LWR_v

Figure 10-8. Starting the upgrade process

Step 9. Upgrading

The Bootloader will first erase the content of the controllers and then write the new firmware data. This process can be monitored in the communication window and the progress bar (both are marked with blue rectangles in the picture below).

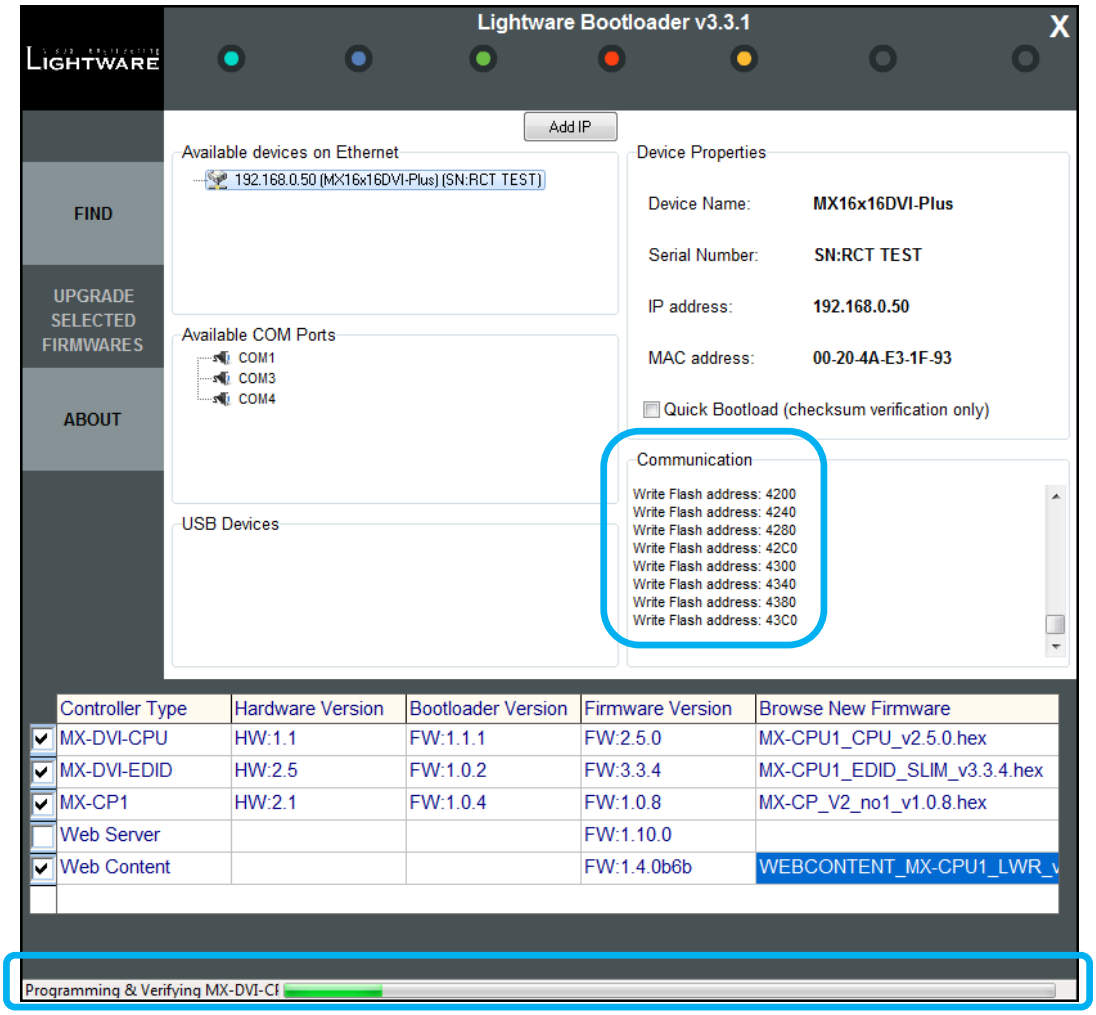

Lightware Bootloader v3.3.1
LIGHTWARE
Add IP
FIND
UPGRADE SELECTED FIRMWARES
ABOUT
Available devices on Ethernet
192.168.0.50 (MX16x16DVI-Plus) (SN:RCT TEST)
Device Properties
Device Name: MX16x16DVI-Plus
Serial Number: SN:RCT TEST
IP address: 192.168.0.50
MAC address: 00-20-4A-E3-1F-93
Quick Bootload (checksum verification only)
Available COM Ports
COM1
COM3
COM4
USB Devices
Communication
Write Flash address: 4200
Write Flash address: 4240
Write Flash address: 4280
Write Flash address: 42C0
Write Flash address: 4300
Write Flash address: 4340
Write Flash address: 4380
Write Flash address: 43C0
Controller Type | Hardware Version | Bootloader Version | Firmware Version | Browse New Firmware
MX-DVI-CPU | HW:1.1 | FW:1.1.1 | FW:2.5.0 | MX-CPU1_CPU_v2.5.0.hex
MX-DVI-EDID | HW:2.5 | FW:1.0.2 | FW:3.3.4 | MX-CPU1_EDID_SLIM_v3.3.4.hex
MX-CP1 | HW:2.1 | FW:1.0.4 | FW:1.0.8 | MX-CP_V2_no1_v1.0.8.hex
Web Server | | | FW:1.10.0 |
Web Content | | | FW:1.4.0b6b | WEBCONTENT_MX-CPU1_LWR_v
Programming & Verifying MX-DVI-CI

Figure 10-9. Upgrading

Step 10. Closing connections

After all controllers are upgraded, the Bootloader will close the connection with the Lightware device, which will reboot itself and return to its normal operating mode.

Warning *Bootloader versions that are older than v3.1.8 will not close the connection and restore the Lightware device until you exit the Bootloader.*

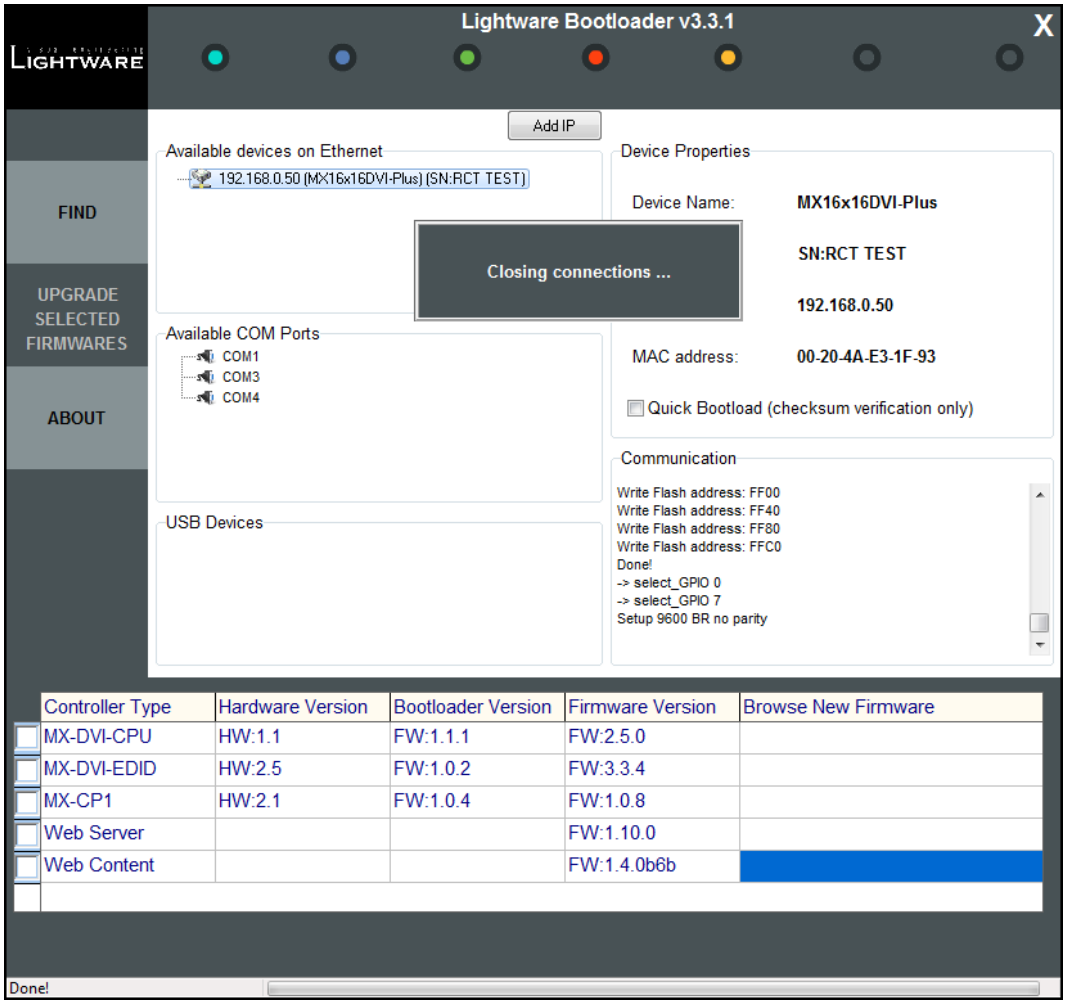


Figure 10-10. Closing connections

Step 11. Upgrade successful

If the connections are closed and no errors occurred, the firmware upgrade is SUCCESSFUL. Click on the **OK** button and then you may exit the Bootloader or connect to another Lightware device to perform firmware upgrades.

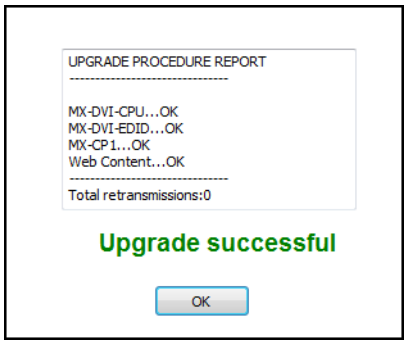


Figure 10-11. Upgrade successful

Step 12. Restart the device

The Lightware device will restart itself automatically, but it is recommended to completely power down and power up the device after exiting the Bootloader.

11. Troubleshooting

11.1. General problems

Check the router

Check whether the router is properly powered and whether CPU LIVE LED is blinking. Try performing a reset through the controller software, or unplug and reconnect the router's power cable.

11.2. Serial connection problems

Check the protocol

Check whether the proper protocol is selected (see sections 4.3.6 and 8.6.7, 8.6.8 on pages 23 and 63 about changing and viewing protocols). Select Protocol #1 in order to use the matrix with the controller software.

Check the cable and software settings

Check whether your mail to female straight serial cable is properly connected. In most cases there are more COM ports present in the operating system. Please verify the connection settings of your software. The router communicates with **9600** Baud, **8** data bit, **N**o parity, **1** stop bit.

11.3. TCP/IP connection problems

Check the LAN cable type

If you connect the router directly to your computer, you must use a cross-link cable. If the matrix is connected to an Ethernet hub, switch or router, you have to use a straight patch LAN cable.

Check the network connection

The computer and the router have to be in the same network. If your computer has multiple network connections (for example WiFi and LAN connections are used simultaneously), check which network the router is connected to. Check the Device Discovery window of the Lightware Device Controller software (see section 5.4 on page 28).

Check the IP settings

If you connect the router directly to your computer, you have to set the router's IP address manually, since in this case there is no DHCP server that could assign an address to the matrix.

If the IP address is set manually, check if there is an IP address conflict. If there is a DHCP server on the network, try to set the matrix to DHCP mode. See section 4.3.5 about how to reset the IP address with the front panel buttons on page 22.

Check whether your computer's firewall blocks the selected port.

Check the protocol

Check whether the proper protocol is selected (see sections 4.3.6 and 8.6.7, 8.6.8 on pages 23 and 63 about changing and viewing protocols). Select Protocol #1 in order to use the matrix with the controller software.

Check the proxy settings

If the connection between the matrix and the computer cannot be created and a proxy server is used in your network please turn off the proxy or add the local network addresses to the proxy exceptions.

Check alive connections

Only one connection is allowed simultaneously. Check whether there is another open connection (e.g. opened router web interface, running control software over Ethernet). Try restarting the router if you have no other option.

11.4. Picture is not displayed or distorted

Check the cables (DVI)

Due to the high data rates, the cables must fit very well. DVI connectors have to be locked with screws, no tensions or breaches are allowed. If your source or display has more connectors then make sure that the proper interface is selected.

Although the router is equipped with DVI-I connectors, analog signals are not supported. You cannot use VGA cables with DVI-VGA adapter plugs.

Check the cables (TP)

Due to the high data rates, high quality cables must be used. It is recommended to use Cat6 or Cat7 S/FTP cables.

Check the crosspoint matrix

Check the connection between the input and output port either on the front panel or from web or the control software. Check whether the output is muted or not.

Check EDID related problems

Maybe your display device is not capable of receiving the sent video format. Try emulating your display device's EDID to the source. You will find help on this process in section 5.8 about EDID router operation with the LDC software on page 35, or in section 6.2 about EDID router operation with built-in website on page 44. If you get a picture now, you have an EDID related issue, please read section 3.1 about understanding EDID on page 14 for more details.

Check the source

Check whether your source is powered on and configured properly. The HDMI output can be turned off on most DVD players. If the source is a computer, then verify that the DVI output is selected and active. Try restarting your computer; if you get a picture during the booting process, you have to review the driver settings.

11.5. Bootload

The Bootloader cannot find the matrix

The Bootloader software always queries the PC's primary Ethernet adapter (which is usually the adapter that is connected to the Internet) for available Lightware devices. It is recommended to disable every other Ethernet device (secondary LAN, Wi-Fi, 3G modem) for the time of the upgrade. If the Bootloader cannot find the Lightware device because the device is connected to the secondary Ethernet adapter (cross UTP connection), you need to disable the primary adapter (Internet). This way the Ethernet adapter which is connected to the Lightware device will become the primary adapter and the Bootloader can query it for Lightware devices. If you disable an Ethernet adapter while the Bootloader is running, you need to restart the Bootloader to be able to query the Ethernet adapter again.

A second option in this case is that if you know the IP address and port number of the Lightware device, you may use the Add IP button which is described in section 10.3.1 on page 75.

Upgrade FAILED

If the connection is unreliable and the Bootloader cannot communicate with the Lightware device, then the ***"Upgrade failed!"*** warning messages appears.

The Bootloader retries the transmission 3 times. If it doesn't succeed, then the upgrade procedure will have FAILED. In this case exit the Bootloader, try to establish a reliable connection with the Lightware device and repeat the upgrade process. It may happen that when you try to find the device again, the Available devices window will only show the IP address of the Lightware device but not the device type and serial number. The reason for this is that the Lightware device may still be in bootload mode and the controllers cannot send any information about themselves. You can still double-click on the IP address and the Bootloader will establish the connection.

No controller selected to upgrade!

If you didn't check any checkboxes left to the controller types then the ***"No controller selected to upgrade!"*** message appears. Click at least one of the checkboxes before you click on the UPGRADE SELECTED FIRMWARES button.

The controller was not upgraded

Make sure that the checkbox next to the controller type is checked before you click on the ***UPGRADE SELECTED FIRMWARES*** button. These checkboxes enable the firmware upgrade on the different controller types.

An invalid file has been selected

The Bootloader checks if valid firmware files have been selected for the controllers. If an invalid file (not firmware file) has been selected, then the ***"WARNING! Upgrade failed: Invalid checksum"*** warning messages appears.

Please select a valid firmware file.

Firmware selected for the wrong controller

If an otherwise valid firmware file has been selected but for the wrong controller, the ***"WARNING! Invalid controller type info for MX16x16DVI-Plus"*** warning message appears.

Please select the appropriate firmware file for the controller.

Corrupt firmware file

If the correct firmware file is selected for the controller but it somehow became corrupted (the checksum is incorrect), then the ***"WARNING! Upgrade failed: Invalid checksum. Invalid controller type info for MX16x16DVI-Plus. Invalid hardware info for MX16x16DVI-Plus."*** warning messages appear.

Please contact your local sales representative or Lightware Support Team at support@lightware.eu and ask for the correct firmware files.

12. Specifications

General

Compliance ..... CE, UL, FCC

EMI/EMC ..... EN 55103-1, EN 55103-2

Safety ..... EN 60065 Class I

Warranty ..... 3 years

Cooling ..... Fan, air flows right to left (as viewed from front)

Operating temperature ..... -20°C ~ +50°C

Humidity ..... 10 ~ 90% RH

Power

AC power connector ..... IEC-320 C14 receptacle (filtered)

Power source ..... 100-240 V AC; 50~60 Hz; max 2.1 - 0.9 A

Power supply ..... Internal

	Power consumption [W]		Power need** [W|	Heat dissipation [BTU/h]	
	typ.	max.*	total max.	typ.	max.**
MX16x16DVI-Plus	36	53	93	123	181
MX12x12DVI-Plus	31	44	74	106	150
MX9x9DVI-Plus	27	36	59	92	123

* Maximum values are calculated when DVI +5V supplied for external devices but these values include only the consumption of the matrix itself.

** Total power need from the electric outlet, when all output ports are loaded with 500mA on DVI +5V. Please note that the power supplied for the external devices is not consumed by the matrix itself but it is needed from the electric outlet.

Enclosure

Rack mountable ..... Yes, 4U high

Material ..... 1 mm steel

Dimensions in mm ..... 482*/440W x 159.8D x 176.5H mm

Dimensions in inches ..... 19*/17.3W x 6.3D x 7H inch

Net Weight ..... 5000 g (11 lbs) / product

* with rack mounting ears

Inputs

Connectors ..... 29-pole DVI-I digital only

Input cable equalization ..... Yes, +12dB fixed

EDID emulation ..... Yes, for each input connector

Outputs

Connectors ..... 29 pole DVI-I digital only

Output pre-emphasis ..... Yes, +6dB fixed

Reclocking ..... No

+5V output current ..... 500 mA continuous on each output

Signal

Data rate: ..... all between 25 Mbps and 2.25 Gbps / TMDS channel

Channels: ..... 1x TMDS Clock + 3x TMDS Colors

Resolutions: all between 640x480 and 1920x1200@60Hz or 2048x1080@60Hz

Color depth: ..... maximum 36 bits, 12 bit/color

Color format ..... RGB, YCbCr 4:4:4

HDTV resolutions: 720p, 1080i, 1080p

HDMI 1.3a compatible: ..... Yes (embedded audio)

HDCP compliant: ..... No

Video delay ..... 0 frame

EDID Support ..... Advanced EDID management

EDID Emulation ..... Yes, 50 factory preset, 50 user programmable

Control

Front Panel buttons..... Yes, 37 buttons

Serial port connector..... 9 pole D-SUB female RS-232 or RS-422

Baud rate ..... 9600 Baud, 8 bit, 1stop bit, no parity

Ethernet port connector ..... Neutrik EtherCON, RJ45 female connector

Ethernet protocol..... TCP/IP, HTTP, TFTP, Telnet

IP address assignment ..... fixed, DHCP, BOOTP, and AutoIP

DVI timing examples

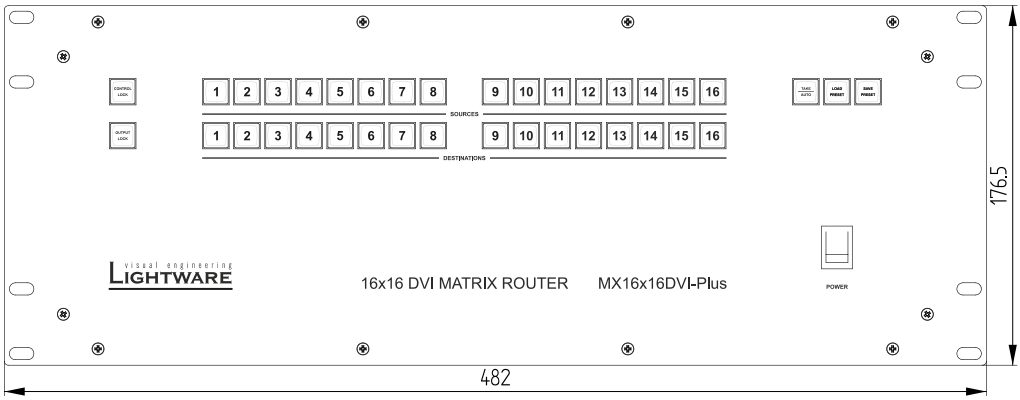
Resolution	Vertical frequency (Hz)	Horizontal frequency (KHz)	TMDS Clock frequency (MHz)	Comment
640x480	60.00	31.47	25.18	**DOS VGA**
800x600	60.32	37.88	40	**VESA SVGA**
800x600	75.00	46.87	49.5	**VESA SVGA**
832x624	74.55	49.72	57.29	**MACINTOSH**
1280x720	60.00	45.00	74,25	**HDTV 720p**
1024x768	60.00	48.36	65	**VESA XGA**
1024x768	75.00	60.02	78.75	**VESA XGA**
1360x768	47.7	60.00		**WIDE-XGA**
1152x870	75.06	68.68	100	**MACINTOSH**
1280x1024	75.00	80.00	135.00	**VESA SXGA**
1400x1050	60.00	65.64	121.82	**SXGA+**
1920x1080i	60.00	67.50	74.25	**1080i**
1920x1080	60.00	67.50	148.5	**HDTV 1080p**
1920x1080	60.00	67.50	185.6	**1080p 10bit**
1920x1080	60.00	67.50	222.75	**1080p 12bit**
2048x1080	60.00	67.50	157.3	**2K**
1600x1200	60.00	75.00	162	**VESA UXGA**
1920x1200	60.00	75.00	162	**VESA**

Table 12-1. DVI timing examples for some typical supported resolutions

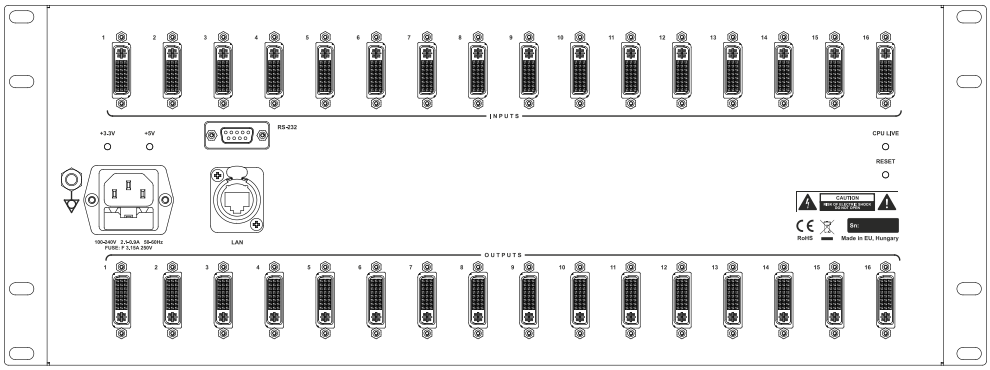
12.1. Mechanical Drawings

MX16x16DVI-Plus can be seen on the drawings, however the dimensions are the same for all the three models. Dimensions are in mm.

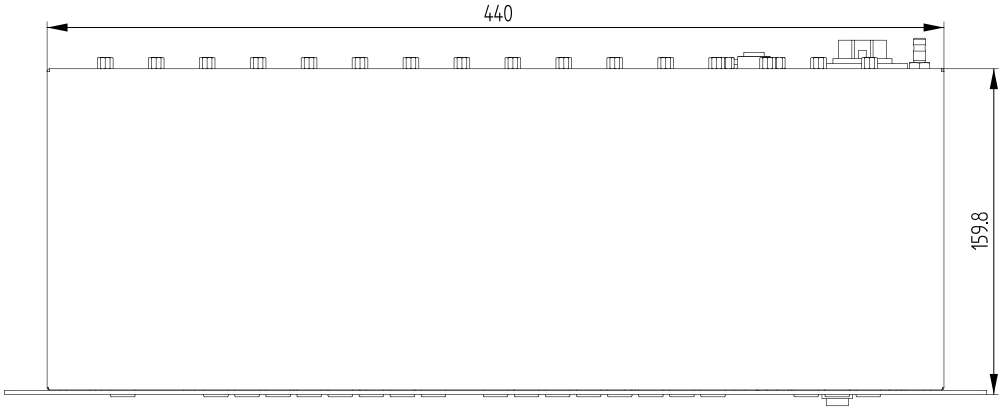
Front View



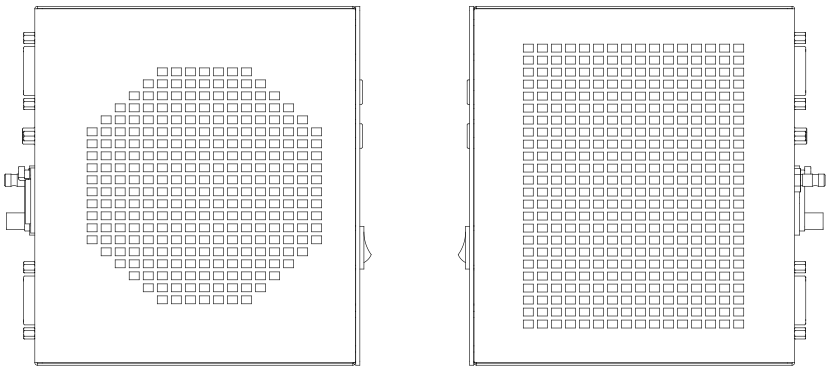
Rear View



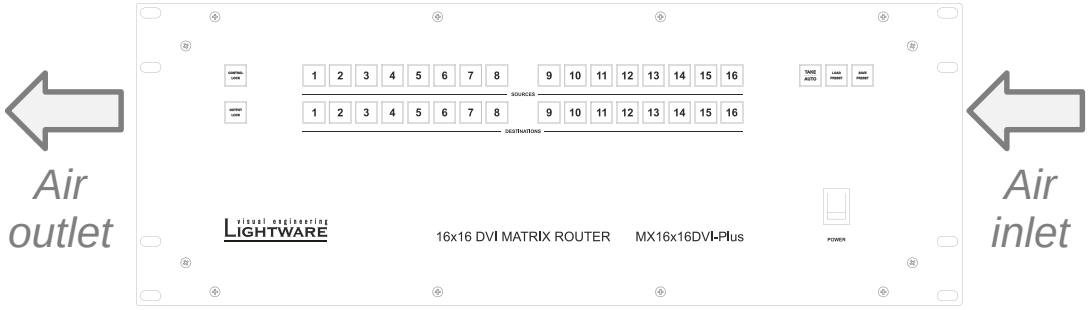
Top View

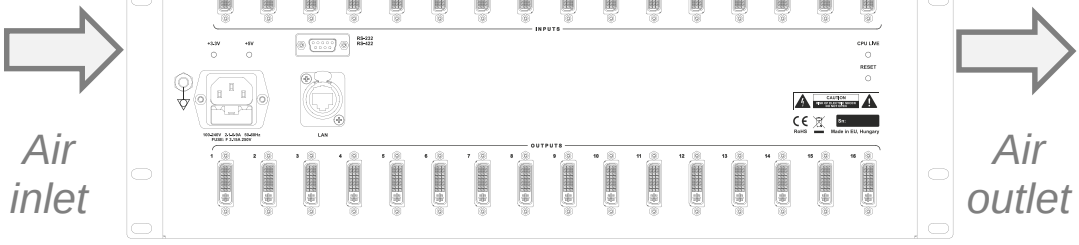


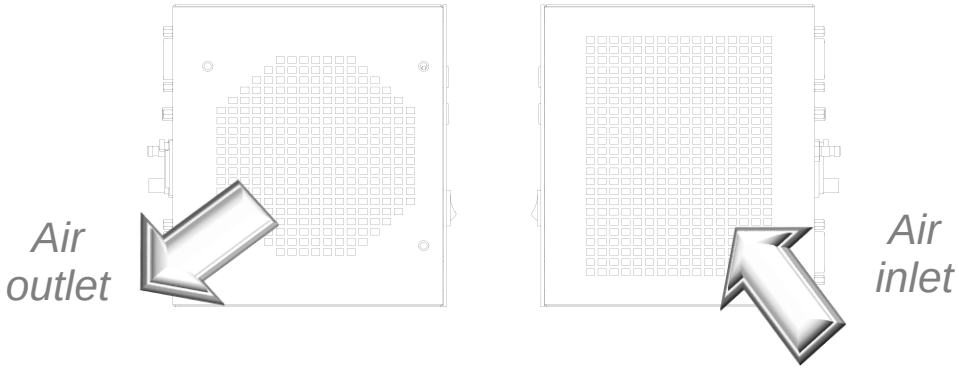
Left view **Right view**



12.2. Airflow directions







13. Version applicability

This User's Manual applies to the following versions of the mentioned software, firmware and hardware:

Item	Version
Lightware Device Controller software	1.4.0b2
Lightware Bootloader software	3.3.1
router CPU firmware (MX-CPU)	2.5.0
router Control Panel firmware (MX-CP)	1.0.8
router EDID firmware (MX-DVI-EDID)	3.3.4
router MOTHERBOARD	SCH: 2.5 PCB: 2,5
router Control Panel hardware SCH	SCH: 2.1 PCB: 2.1
router Web Content	1.4.1
router Web Server	1.1.6

14. Warranty

Lightware Visual Engineering warrants this product against defects in materials and workmanship for a period of three years from the date of purchase.

The customer shall pay shipping charges when unit is returned for repair. Lightware will cover shipping charges for return shipments to customers.

In case of defect please call your local representative, or Lightware at

Lightware Visual Engineering

15 Peterdy Street, Budapest H-1071, HUNGARY

E-mail: support@lightware.eu

15. Document revision history

Document	Release Date	Changes	Editor
Rev. 1.0	28-09-2012	Initial version	Zsolt Marko
Rev. 1.1	16-07-2015	Lightware Device Controller added, Bootloader upgraded, Typographical corrections and minor changes in the formatting.	Laszlo Zsedenyi